INTEL'S NEW 3.8GHz PENTIUM 4J
How fast is it? Find out on page 74!

POWER SUPPLY SHOWDOWN
Our Lab tortures 7 new PSUs

MAXIMUM PC

PC TECH 2005
THE BREAKTHROUGH

Amazing new technologies will reinvent your PC

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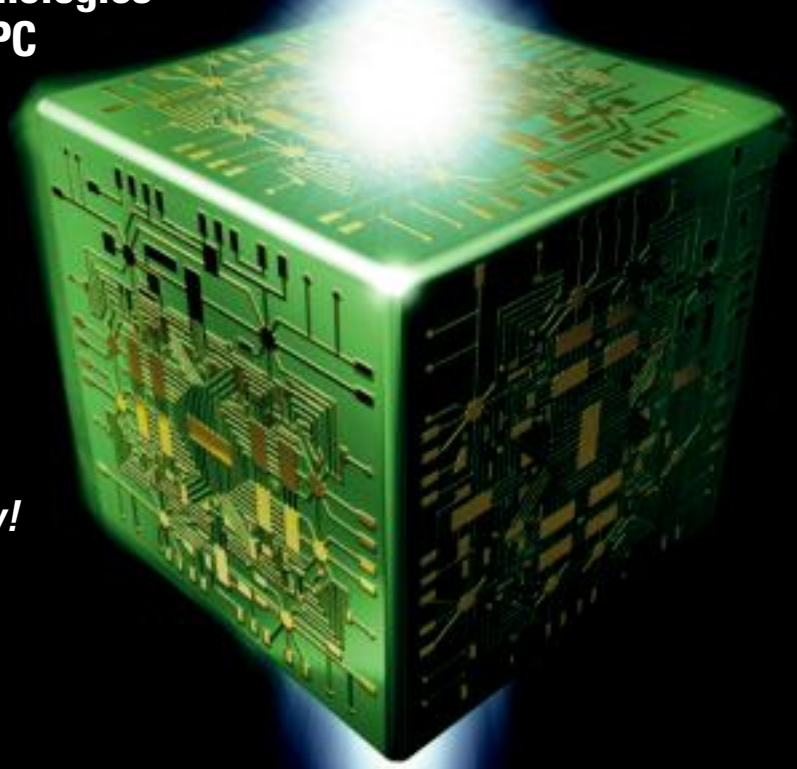

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Release Notes

New Year, New Projects

This month, we take a long, hard look at 19 new PC technologies that promise to evolve your PC's performance and functionality to new levels. It's the perfect story for the onset of 2005. Flush with loot from the holidays, we can all hunker down and begin the entertaining process of mapping out the year's upgrades.

I often get so caught up in thinking about upgrading my rigs for performance during this pre-spring fling that I overlook more basic, non-performance-related PC tasks. No more! I hereby commit to the following PC projects in 2005.

Get my digital audio together: 2005 is the year I rip, archive, and organize my entire music library. I'm going to start by organizing all the songs in my existing digital library; I'll get the song/artist/album names right, then I'll make sure it's properly organized. Then I'm going to rip every CD I have to FLAC, or maybe Apple's proprietary lossless format. This will ensure archival-quality sound, in case I lose or scratch a CD. Then I'm going to convert these files into a smaller, more portable digital format like 192Kbps MP3s. The result will be a song collection that's easy to sort, easy to move onto my portable music player, and easy to stream throughout my house.

Build the ultimate media server: I want to take one of my old systems and turn it into a high-capacity server exclusively dedicated to storing all my music and photographs. On top of this, I want to get some PVR action going. I'm envisioning four to five TV tuners, with an equal number of cable boxes. Using an off-the-shelf copy of WinXP Media Center Edition 2005 or *BeyondTV*, or maybe *SageTV*, I'll be able to record anything and everything and stream it throughout my house.

Wire my house: The more I've worked with streaming media, the more I want to run Gigabit Ethernet to key areas of my house. Don't get me wrong—I'll still use Wi-Fi for my notebook and more simple tasks. But there's no way I'll be able to stream hiccup-free video from my media server to other rooms in my house without wires. It shouldn't be too difficult a task. And once it's done, it will be easy to upgrade in the future.

Computerize my kitchen: It's time to build—or buy—a kitchen PC. I'm thinking something simple mounted near the stove and prep area, with a small screen (and a protective coating), and possibly a touch-screen display. Hmmm...maybe I'll convert a tablet PC?

THE EIC'S PICKS

TECHNOLOGY PREVIEW: We had a blast putting this cover story together, and the result is a great opener followed by a deep, insightful look at the next 12 months. *Page 30.*

HALF-LIFE 2: I'm particularly proud of this feature story. We go past the obvious here to break down the most sophisticated game design ever. *Page 44.*

POWER SUPPLY SHOWDOWN: I love the opening art in this story. Majestic! *Page 52.*

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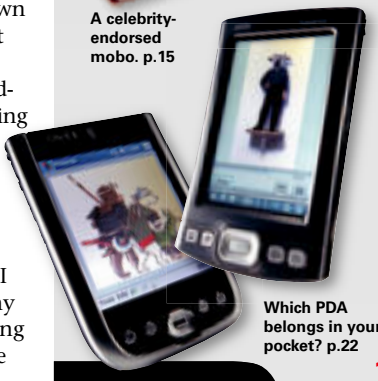

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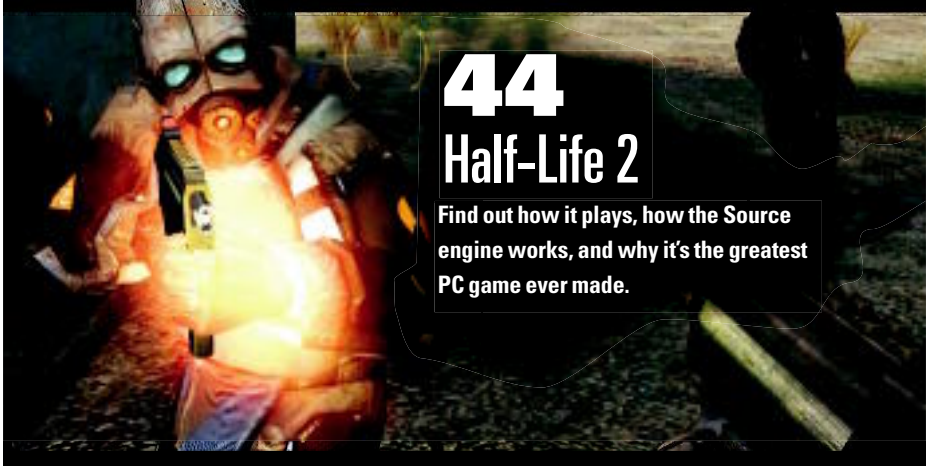

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In/Out

You write, we respond

YES, WE'RE SURE

In your December 2004 issue you have a review of a Pioneer DVR-A08 double-layer dual-format DVD burner. Are you sure you aren't reviewing the DVR-A09? I thought the A08 came out in July or August. As for the 7 verdict—since when is the overall score of a drive brought down by the lackluster software in the box? I seem to recall previous optical drive reviews where the score was a 9 or 9/Kick Ass with the reviewer saying the included software brought down the score from a 9/Kick Ass or 10/Kick Ass. But a 2-3 point drop because of the bad software? What were you reviewing: the drive or the software?

—WILL

BIG MEANIE LOGAN DECKER RESPONDS: We did indeed review the DVR-A08 last month. There is no DVR-A09 from Pioneer yet, and hopefully Pioneer will allow time for media manufacturing to ramp up before it begins marketing a new drive.

The harsh verdict—and it was harsh, given the top speed of the drive—emerged from a number of issues covered in the review. First of all, the hype factor is out of control. The packaging boasts 4x DVD-R DL burn speeds, but we still can't find the media on store shelves. What's the point? If you purchase this drive because your set-top DVD player prefers DVD-R discs and you need more capacity than single-layer discs provide, you're gambling on the hopes that media will be attainable at some nebulous point in the future after you purchase the drive. That's silly.

Although our reviews are generally focused on hardware, Pioneer's software blunder deserved particular emphasis. We mentioned that software errors ruined two double-layer discs; that's a $30 loss—almost 20 percent of the cost of the drive itself! Think of it this way: Automobile reviewers don't make a fuss about the airbags—unless they don't work.

It's a good drive, and tremendously fast, but in order to get a superior verdict and a Kick Ass award, manufacturers need to deliver on *all* their promises.

SLI = FOUR DISPLAYS?

I just finished reading the December 2004 "Gear of the Year," specifically the write-up about nVidia's GeForce 6800 Ultras on the PCI Express bus with SLI. I'm planning to build a new machine for digital editing within the next few months, and my question is this: If I purchase this dual-card setup with each card having two DVI connections, will I be able to run three or four monitors, with each monitor having a different program open on its screen? I would like to be able to run *Premiere Pro* on one screen, *After Effects* on another screen, and the final rendering of the movie/documentary on the two other screens.

—ALAN SHIFLETTE

TECHNICAL EDITOR WILL SMITH RESPONDS: You can definitely connect four monitors to a dual-card SLI rig, but if you aren't going to use the system for gaming, we strongly recommend you use the cheaper (around $250) GeForce 6600 PCI Express cards instead of the $500 6800 Ultra boards.

SATA CONTROLLERS?

Which SATA controller do you recommend? Are some better than others?

—PHIL KRITZMAN

ASSOCIATE EDITOR JOSH NOREM RESPONDS: The reason we haven't reviewed any of these cards is twofold. First, there are primarily just two companies making cards: Silicon Image and Promise. Both make great SATA controller cards that we highly recommend.

Second, in our experience, the performance difference between these cards is practically nil because today's fastest hard drives are still incapable of saturating an older ATA 66 controller, much less a SATA 150 controller (Western Digital's Raptor is a different story, of course). Even though the interface has changed and the bandwidth for the channel has opened up a bit from ATA 133 to SATA 150, actual drive performance has changed very little because hard drives themselves have received only modest speed bumps over the past few years.

All the performance gains we've seen in the latest drives are the result of internal improvements such as larger buffers, faster spindle speeds, and higher areal densities. The move to SATA makes drive installation easier, but by itself, the interface doesn't provide any speed improvements over parallel ATA.

MEDIA CENTER ADDENDUM

I just finished reading your article on Media Center PCs in the December 2004 issue and want to comment on two issues.

One issue your article didn't address is how the Tivo and Media Center PCs interface with a cable or satellite box. My cable company won't give me a cable box with an activated serial port so I have to use the included IR emitters. I've never had my Tivo crash, but I do miss recordings or have the wrong show recorded because my cable box didn't receive the channel change command correctly. I probably have one missed/wrong recording out of every 30. That's a big factor for the reliability of Tivo, even if it's the cable box's fault.

Also, Tivo no longer charges extra to network two Tivos or to access music and photos from your PC. You would of course have to buy another Tivo, pay another monthly fee (at a reduced rate of $6.95), and buy a USB-to-Ethernet or USB-to-Wi-Fi adapter.

—TRAVIS BLANTON

EDITOR-IN-CHIEF GEORGE JONES RESPONDS: Good point, Travis. Also known as an IR blaster, the device you mention connects to your USB port and has a wire lead you attach to an IR emitter that you literally stick onto the IR receiver on your cable or satellite box. Obviously, this technology is much less reliable than a direct serial connection. If set to transmit IR signals too rapidly, the IR emission can fail, resulting in faulty automated channel-changing and missed recordings. In our experience—with both Tivo and Media Centers—you can achieve 100 percent accuracy by slowing down the speed of the IR transmission. Simply go into the Media Center or Tivo setup for the cable/satellite box connection, and reduce the "Speed" setting to slow.

VIVA LA REVOLUCION!?

In the December 2004 issue's game review of *Call Of Duty: United Offensive*, I noticed the positive heading in the verdict box was "Communists" and the negative was "Fascists." I understand the choice for negative just fine, but the positive had me a bit flummoxed. Considering that the death toll of innocent human beings resulting from the reign of Stalin alone significantly outpaces the fetid goose-stepper we all love to hate by about 30 million (this isn't counting Pol Pot and Mao), I find the analogy disturbing, to

COMING NEXT MONTH IN THE HAVE-YOUR-PET-SPAYED-OR-NEUTERED FEBRUARY ISSUE OF MAXIMUM PC

THE PERFECT OS FOR THE PERFECT PC

You drew up the blueprints. You bought the best components. You painstakingly put each piece together. But that's only half the job. Next month, we'll explain the dos and don'ts of perpetually maintaining your PC in perfect working condition!

TAKE THE LINUX PLUNGE

Open source meets reality TV when Tech Editor Will Smith dumps Windows and adopts Linux for six months.

THE 2005 SOFTY AWARDS

Maximum PC tips its tinfoil hat to the finest, the fastest, and the most innovative apps.

say the least. I think someone at the *Maximum PC* office has been taking their Rage Against The Machine CDs a bit too seriously.

—JEFF CARO

EDITOR IN CHIEF GEORGE JONES RESPONDS: Thanks for siccing Homeland Security on us, Jeff. Not that we're defending communism, but many scholars would argue that "communism," as practiced by dictators like Stalin and Mao Tse Tung, isn't authentic because it was artificially induced, whereas Marx argued that communism would be a natural evolution. Regardless, the editor responsible for this plus/minus fiasco has been reassigned to our sister magazine, *Maximum PC: Siberia*.

DOOM 3 IS A TURD...

Doom 3 is a turd. That's right. I said it. Everybody thinks it, but nobody wants to say it. It's as though we are all thinking about it in the back of our minds, but nobody wants to be the first to say it out loud.

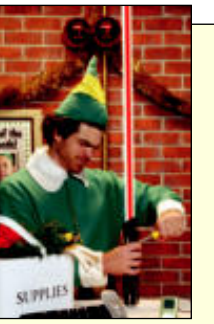
I am still trying to figure out why it takes an uber-PC to play a game that's mostly set in the dark. I'm no PC graphics wiz. Could you explain how rendering black in 1600x1200 at 4x AA is such a huge resource hog?

—RAY DZEK

TECHNICAL EDITOR WILL SMITH RESPONDS: Regardless of how you feel about *Doom 3*, which received an 8 verdict in our October 2004 issue, the engine remains the most advanced real-time graphical renderer we've ever seen.

The best and worst thing about *Doom 3* is its fully dynamic lighting model. Virtually every other game we've ever played—including *Half-Life 2* and *Far Cry*—uses a hybrid lighting model, where the vast majority of lights are static and pre-computed by the developer when the map is created. In contrast, *Doom 3* performs all lighting calculations in real time as you play the game. To put this in perspective, the static lights in *Half-Life 2* were made using a bunch of computers working together, and it still took 20 to 30 minutes to calculate the lighting for each level!

The problem is that when multiple dynamic lights interact with each other, the horsepower required to draw them increases exponentially. Today's computers just don't have the juice to draw more than a couple of dynamic lights at the same time. This is why many of the rooms in the game have only one or two lights in them. The *Doom 3* engine is a perfect example of why software companies usually ride behind the hardware curve instead of ahead of it.



DOWN, FANBOY, DOWN!

After I got my December magazine and started reading "The Great Geek Gift Guide," I was pumped when I saw the replica light sabers! I quickly rushed to the web site listed (**www.sharperimage.com**), and after all my searching, I was never able to locate the product. Has Sharper Image decided to not carry this replica? Or is it just slow on posting the new addition to the web site?

—ANTONIO ARAIZA

PADEWAN BURNER LOGAN DECKER RESPONDS: After the issue went to press, The Sharper Image dumped the awesome Force FX Light Saber from its catalog, no doubt replacing it with some cordless nose-hair trimming, ionic air purifying, MP3 playing gizmo. The good news is that you can still buy the Force FX in Vader red, Skywalker blue, and Mace Windu mauve (aka purple) for $120 at www.masterreplicas.com. While you're there, don't forget to check out the dainty Princess Leia Blaster, the stylishly retro Tricorder from the original *Star Trek*, and the shockingly suggestive model of the Hybrid Chestburster from *Aliens vs. Predator*.

...AND SO IS HALF-LIFE 2?

Am I the only one in the world who thinks *Half-Life 2* isn't infallible? I'm running it on my Dell 8600 Inspiron. Now, granted, that system is underpowered for running that level of game, but should it really take me more than two and a half hours to install? Another thing is the copy-protection. I don't have a problem with having to create an account with Steam online, but with my crappy dial-up connection, it's a hassle to play the game.

—LUKE MOERER

TECHNICAL EDITOR WILL SMITH RESPONDS: In addition to the online mode, Steam has an offline mode for the Internet impaired. After you log onto Steam the first time, if you tell it to save your password, you should be able to play *Half-Life 2* in offline mode whenever you want. There are full details at www.steampowered.com. As for your slow unlock, we'd guess that the problem is your computer's slow CPU, not your slow dial-up connection. The *Half-Life 2* files are encrypted using a technique that takes a ton of CPU power to decrypt, and that takes a while on a slow machine.

We're not going to deduct points from *Half-Life 2's* more-than-perfect score because of flaws with the online distribution for two reasons. One, there are always problems and hassles with new technologies like this. Two, we rate games, not publishing methods. Once the kinks are worked out, we think systems like Steam, which allow online distribution and fight piracy will do nothing but help gaming on the PC platform. ■

CUT, COPY, PASTE

We goofed twice in our Great Geek Gift Guide (December 2004). On page 46, the photographs for the Garmin Etrex GPS device and Casio's EXZ55 digicam were inadvertently juxtaposed. And on page 49, the web address we listed for the iPod car connector is incorrect. The correct URL is www.densionusa.com. We blame Pickles the Elf and his "magical" 9.4% Elf Brew.

LETTERS POLICY: *MAXIMUM PC* invites your thoughts and comments. Send them to **input@maximumpc.com**. Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

QuickStart

The beginning of the magazine, where articles are small

MISSING! Two Next-Gen Videocard Technologies

Where are all the high-end PCI Express videocards? And how about Alienware's homegrown dual-card technology? *Maximum PC* investigates

Case #1: Where are the PCI Express versions of the ATI Radeon X800 XT Platinum Edition and GeForce 6800 Ultra?

It's a fact that high-end PCI Express videocards are hard to find, especially through retail channels. The culprit is the small installed base of PCI Express motherboards. None of the board manufacturers see a large enough market for PCI Express graphics accelerators to commit a big chunk of their limited shelf space to these products at large nationwide retailers like Best Buy and CompUSA.

But just because the boards aren't on store shelves doesn't mean they're completely unavailable. Intrepid upgraders should be able to find PCI Express GeForce 6800 Ultra and Radeon X800 XT boards online through gray market retailers that can be found on sites like Pricewatch.com.

That said, you're not going to be able to find any PCI Express X800 XT Platinum Edition boards. This is because ATI has pumped its allocation of Platinum-worthy GPUs into AGP boards, where it can barely meet demand. But hope is on the horizon—look for the next-gen X850 XT Platinum to ship first in PCI Express flavor next month.

As AGP gets brushed aside by PCI Express over the next year, this trend will surely wane, resulting in more PCI Express videocard options over the next six months.

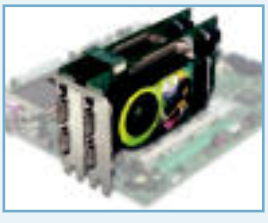
Case #2: Whatever happened to Alienware's Video Array technology?

We first mentioned Alienware's proprietary dual-videocard technology—dubbed Video Array—in our June 2004 issue, but we still haven't seen a single system from Alienware that actually uses this tech. In fact, the only dual-videocard rig we've seen to date—an Alienware rig we review on page 76 of this issue—uses nVidia's SLI design.

This is perplexing, to say the least. When contacted, Alienware confirmed it has ditched plans to sell Video Array tech to consumers: "We currently plan to market our patent-pending Video Array solution exclusively to enterprise customers." Particularly interesting is a comment by Alienware's Frank Azor: "We feel a sense of accomplishment in that both nVidia and ATI acted on our idea to reintroduce a dual-videocard solution for the PC." Is ATI SLI on the way?

SLI Upgrade Stumper

Will upgrading to an SLI system be faster than buying the latest card every year?



High-end users believe that their next system should include a spare PCI Express slot, so they can buy one SLI-capable videocard today, and then add a second card later when prices drop. While this seems like a good idea, it's important to carefully consider your timing before you take the plunge.

For example, if you buy a GeForce 6800 GT now for $400, drop it in your new nForce4 mobo, and wait six months to add a second videocard, which you pay $300 for, you will have a dual-card system that's faster than any single-card system you can buy for about six months.

This works fine as long as videocard manufacturers simply rev existing chipsets for small performance increases (10 percent or so). But when nVidia and ATI release entirely new chipsets, the performance gains will be more substantial. By way of example, the performance difference between a last-gen 9800 XT and a new-gen X800 XT is almost 100 percent. The bottom line is this: If you buy your second card right before the next-gen graphics hardware comes out, your dual-card performance is likely to be inferior to a single next-gen GPU.

We expect to see the next-generation GPU cores—NV50 from nVidia and R500 from ATI—sometime in late 2005 or early 2006. Make your purchases accordingly. Which pretty much means, right now.

Abit Launches Fatal1ty Line of Gaming Hardware

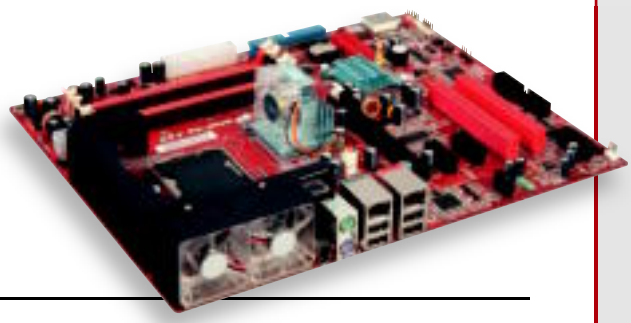
The first celebrity-endorsed mobo and videocard leaves us hot—and cold

Abit recently unveiled the first celebrity-endorsed line of gaming hardware when it pulled the wraps off its "Fatal1ty" AA8XE motherboard and X700XT videocard. Both are endorsed by Jonathan "Fatal1ty" Wendel, who is one of the most successful players—competitively and in terms of media exposure—on the fledgling pro gaming circuit.

Fatal1ty's partnership with Abit is notable because it is the first celebrity endorsement of a PC component, and also because the motherboard Abit has crafted is a jam-packed specimen we can't wait to test in the Lab. The red PCB mobo is based on Intel's new 925x LG775 chipset. Besides boasting PCI Express, dual LAN, and onboard 7.1 channel audio, it features a frosty cooling solution that includes two fans over the DDR2 memory slots, a wind tunnel around the CPU, and a vertical fan over the PCI Express video slot. Case modders will appreciate that the board is backlit with red LEDs, and overclockers will enjoy the ability to tune FSB speeds and CPU voltages from within Windows.

Unfortunately, as impressive as the Fatal1ty mobo is, Abit's celebrity-endorsed videocard is equally discouraging—and puzzling. Abit chose a gimpy eight-pipe X700XT videocard to bear Fatal1ty's name, which makes no sense. While Abit promises a custom-cooling solution for the card, it still won't be any match for faster, 16- and 12-pipe cards in 3D performance.

For full details on Abit's new line of Fatal1ty gaming hardware, check out www.abit-usa.com. You can expect a review of both products as soon as they're released.



If you're considering a career in professional gaming, just think: Someday you could have a motherboard named after you.

All Passengers: Please Stow Your Subwoofers and Prepare for Takeoff

The guy sitting next to you on the bus or plane might not like it, but Saitek's new Notebook subwoofer lets you take your bass on the road for mobile thumpage. It runs off any USB port and pumps out 2 watts of lap-shaking bass. Check it out at www.saitek.com.

FAST FORWARD BY TOM R. HALFHILL

The Superiority of Designer Genes

While AMD and Intel boast about their upcoming dual-core processors, how would you like a computer with 131,072 processors?

IBM has dazzled the not-easily-impressed scientific community by breaking the world speed record with its new BlueGene/L supercomputer. BlueGene/L scored a whopping 70.72 trillion floating-point operations per second (teraflops) on the Linpack benchmark, which blew away NASA's brand-new Columbia supercomputer (51.87 teraflops) and doubled the performance of the previous world champion, NEC's Earth Simulator. And BlueGene/L isn't even finished. It's a working prototype of a machine IBM will deliver to the Lawrence Livermore National Laboratory next year. The prototype has only one-fourth as many processors as envisioned for the finished system.

You would expect a world-class supercomputer like BlueGene/L to scream at a multi-gigahertz clock speed. But you would be wrong. BlueGene/L plods along at 700MHz. It's a great example of how multiprocessing can deliver superior performance without resorting to stratospheric clock frequencies. Yep, there's good reason why AMD and Intel are betting that their new multi-core designs will boost PC performance.

Besides its slow-poke clock speed, BlueGene/L has other oddities. It's based on a 5-year-old 32-bit PowerPC 440 processor core previously found only in chips for embedded applications, like networking equipment. It's a sound design, but not as advanced as the latest Pentium 4 or Athlon 64. It doesn't even have a floating-point unit (FPU), a requirement for scientific computing. IBM had to graft a newly designed FPU onto the PowerPC 440 to make it suitable for a supercomputer.

At the same time, IBM integrated two PowerPC 440 cores on one chip, just as AMD and Intel are doing with their dual-core chips. But whereas AMD and Intel will manufacture their dual-core wonders with the latest 90-nanometer fabrication technology, IBM is making BlueGene/L chips with an old-hat 0.13-micron process.

The secret to BlueGene/L's success is massive parallelism. The finished supercomputer will have 65,536 dual-core chips with 131,072 processor cores. They're linked by five independent wiring networks for control signals and data. Remarkably, one network runs at 1.4GHz, making BlueGene/L the first processor I know of that drives an I/O interface faster than the CPU core. Usually, I/O runs slower than the core.

BlueGene/L's massively parallel system architecture isn't easily imitated by PCs. Very little PC software has the parallelism inherent in many scientific applications. Nevertheless, IBM's multicore, multiprocessor, multinetwork supercomputer contains important clues about the future of general-purpose computing.

Tom Halfhill was formerly a senior editor for Byte *magazine and now an analyst for* Microprocessor Report.

Sleepless in Seattle

Speakeasy is the first ISP to bring WiMax to the masses

WiMax is coming to a town near you. If you live in Seattle, that is.

Wireless Internet is all the rage these days, but ultimately, Wi-Fi remains dependent on cords and cables. These inhumane circumstances recently changed for the residents of downtown Seattle. Speakeasy, a national ISP located in—where else?—Seattle, is preparing the first national launch of WiMax. Also known as 802.16, this protocol is a long-range wireless broadband service that has the potential to blanket a 30-mile area.

Though the technology is still in its infancy, it holds great promise. WiMax could some day offer up to 70Mb of shared bandwidth per transmission tower—that's enough to provide T1-speed Internet to more than 60 businesses and 1,000 homes simultaneously.

Upon its debut in Seattle, however, Speakeasy is expected to offer just 3Mb download/upload speeds, and will most likely sign up just a handful of business at the start. According to Speakeasy, no more than 500 users will be able to access the service at once during the early stages of the rollout because opening the network bandwidth to more users would quickly clog the pipes.

Speakeasy has not posted official pricing, but Speakeasy CEO Bruce Chatterley has indicated that a T1-equivalent will cost about $300 per month. The company had no word about when the rollout would be extended to other metropolitan areas.

You Can't Even Scratch It if You Try!

TDK develops bullet-proof coating for optical discs

The day after the first optical drive was invented, the first scratched CD-R was invented by a careless lab technician. Or so the story goes. In the near future though, scratched discs may be a problem of the past, thanks to a tough new coating being developed by TDK.

The new coating sports a transparent polymer outer layer that is resistant to both abrasions and fluids, so you can scrape it on the ground as much as you want and even write all over the data side of the disc without worrying about losing data. We tested TDK's current optical disc protection, dubbed Armor Plated and available now ($13 per five-pack) by scraping it across cement with our feet and we were unable to damage the disc at all. According to TDK, its upcoming technology is even stronger.

Amazingly, TDK's new coating for optical discs is even tougher than its current armor-plated protection.

The company's method for producing the armored discs involves spin-coating each disc with two separate layers of miniscule silica particles to resist scratch damage, and then dousing the disc with fluorine resin to repel liquids. A curing agent called acetophenone is then spread over the layers. Finally, each disc is cured with a UV light. TDK, which has recently filed patents for the polymer coating, has not revealed exactly how these two layers successfully protect the disc.

TDK has not released any plans to sell DVD media with its new coating to the consumer market. Instead, it will most likely show up in high-capacity Blu-Ray recording discs that Sony, Philips, and Panasonic plan to launch in 2005 to succeed DVDs. The Blue-Ray group has already given an official "thumbs up" to the TDK technology, which will allow Blu-Ray drives to operate without the need for a caddy cartridge.

FUN-SIZE NEWS

SPAMMER GETS THE SLAMMER

Jeremy Jaynes is a spammer. He sent e-mails to people he didn't know and advertised products they didn't ask about. Even worse, he spoofed his sender's address to get around spam filters. In doing so, he ran afoul of a Virginia law that bars people from doing just that. Jeremy Jaynes got busted, and in the nation's first felony prosecution of a spammer, he will spend the next nine years of his life in jail. That's your lesson for tonight, kids. Sleep tight.

WHEN IT RAINS, IT BITTORENTS

Through "deep packet analysis" of network traffic, British research firm CacheLogic has concluded that a third of Internet traffic is attributable to the file-sharing protocol Bittorrent. That's more than all the other file-sharing networks combined. It should be noted that the report just happens to benefit CacheLogic, which markets software to help network admins deal with P2P traffic. But the research is making enough of a hubbub to capture the attention of the Motion Picture Association of America (MPAA), which is now making even more of a stink about suing file-sharers RIAA-style.

INTEL FLIP-FLOPS

Geek gossip-hounds at the web site The Register quoted an Intel marketing chief as saying that Wi-Fi will once again be integrated into desktop chipsets in the last half of this year. Although it was dropped from the i915 and i925 chipsets, the Wi-Fi "Caswell 2" module is expected to appear in the next generation of chipsets and will allow desktop PCs to act as Wi-Fi access points, possibly as part of a *putsch* to promote the Media Center platform.

GAME THEORY BY THOMAS L. McDONALD

All This and Headcrabs Too

For a little while there, it seemed like Vivendi Universal would take Valve Software's *Half-Life 2* ball and spike it at the 10 yard line out of pure pique. The reasons are clear: Steam, Valve's online service, has pulled off the first effective digital-only delivery of a game. This rocks the retailer/publisher/creator relationship to its core, and jeopardizes all those millions of dollars publishers make via boxed copies and the retail channel. Given Valve's overwhelming success in selling pre-orders for *Half-Life 2* over Steam, it was no surprise that Vivendi pitched a hissy fit and refused to let Valve "unlock" the downloaded version of the game a few days early, leaving fans vibrating with anticipation at a frequency high enough to crack glass.

Masterpiece is not too strong a word for *Half-Life 2*. There are precious few works of certifiable genius and perfection in the history of gaming. This is one of them. It's been six years since the original *Half-Life*, and as year after year ticked by, I began to doubt Valve could pull it off. The long development cycle and years of silence left me deeply cynical that the Valve team was wasting time playing networked Sailor Moon Video Strip Poker (now with Chibi-Moon!). Clearly, this sentiment was wrong in a truly monumental way.

As they say about over-budget movies, "It's all up there on the screen." In this case, those six years seem etched onto every frame. We explore *Half-Life 2* in detail on page 44, so I won't belabor the details, but what strikes me most is how this experience is the anti-*Doom 3*. *Half-Life 2's* detailed and sublimely involving world and effortless forward thrust serve as a megaphone for *Doom 3's* many deficiencies. Its crude, funhouse tricks look even more tatty and uninspired now.

From the first 10 seconds, *HL2* creates a sense of dread, dislocation, and disorientation, leaving the gamer feeling helpless as he stumbles, unarmed, through a new, confusing, and hostile environment. As the game opens, information is fragmentary, but it soon becomes clear that everyone views you (Gordon Freeman) as a messiah figure, and when The Suit is finally unveiled, it takes on a quasi-religious dimension: vestments for the avenging savior.

It's a moment that will long live as a game-geek barometer: The hardcore among us admitting (if only to ourselves) that at the moment we saw the hazard suit and the music from the original *Half-Life* kicked in, we got goose bumps.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

Print Me Up a Mobo

Espon uses inkjet technology to generate advanced multilayer circuit boards

Believe it or not, this circuit board was made with an inkjet printer, and has more than three times as many layers as the latest Pentium 4 mobo from Intel.

It sounds impossible, but Epson has developed a method of printing multilayer circuit boards using inkjet technology. The fledgling circuit board shown here is a mere 1mm thick yet boasts an impressive 20-layer design. To put this into perspective, the latest Intel 925X-based motherboard uses a six-layer design.

Traditionally, circuit boards are created using a process called photolithography, which is similar to conventional lithography and involves the transference of a pattern from a photomask to the surface of a silicon wafer. However, this process is becoming increasingly difficult as circuits become more complex, thus impeding the process of creating through-holes to connect the various circuit layers on a board.

Epson's new technology simply paints the layers on top of each other, much like laying down a row of red ink and then blue ink to create the color green. Instead of using pigment-based ink though, Epson uses a conductive ink that contains silver micro-particles just several nanometers in diameter. The circuits are completed with a newly-developed insulator ink.

Before you begin salivating over a 1mm thick motherboard for your next PC, keep in mind that the technology is still a few years away. Upon its release, Epson's new use for inkjet printing will most likely be used in portable devices and other lightweight computing applications. It was unclear at press time exactly how many inkjet cartridges you might need to print up your own mobo.

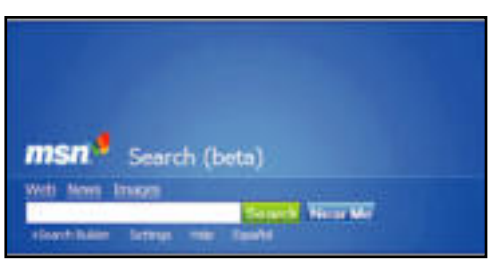
"We'll Take Search for 1 Trillion Dollars"

Microsoft unveils a brand-new search engine

Now that Google is officially both a noun and a verb, Microsoft has decided to get into the search engine game with the recently announced MSN Search. The beta version of the engine became available in November at http://beta.search.msn.com/.

Behind the scenes, Microsoft's new toy behaves a lot like Google, crawling the Internet and indexing web pages. It then creates a database of all the sites it has scanned, allowing the service to deliver accurate results in a split-second. At launch, Microsoft stated its engine could produce results from more than 5 billion indexed pages. Not surprisingly, on the day of the launch, Google upped its indexed page count from 4 billion pages to more than 8 billion in an effort to throw cold water on Microsoft's rollout.

To its credit, MSN Search currently offers one feature Google lacks—the ability to perform a search for results that are near your location, which is helpful for local businesses, like restaurants and escort services. At press time it was not clear when beta testing would be complete, nor was it clear how and when Microsoft intends to bundle the search engine into the next version of Windows.



Microsoft's search engine offers two features Google lacks—local searches and a preponderance of blue.

TechnoFile

Quick takes on technology trends

Mitsubishi SCOPO

Mitsubishi's take on the wearable display is the most intuitive we've seen to date. The Scopo's modern-looking headset (seen here) includes a tiny, eye-level LCD, which displays a video feed from an attached cellphone, laptop, or PDA. Because of the lens' close proximity to your eye, the resulting visual image fills your field of vision.

Content is streamed to the SCOPO's display from this belt-mounted unit.

The real beauty of the Scopo, however, is that because the display is positioned slightly below eye level, it doesn't obstruct your normal vision. The result: You'll be able to operate heavy machinery while playing *Half-Life 2*. **$400, http://global.mitsubishielectric.com/**

Head2Head

A showdown among natural competitors

THIS MONTH: PDAs

It's back into the ring for Palm and Pocket PC with the introduction of new flagship handhelds for both platforms. Palm OS PDAs used to be the no-nonsense handhelds for no-nonsense folks who wanted a smart and efficient organizer, but the Tungsten T5 has gone glam with a fast processor and an orgy of nonvolatile flash memory. Pocket PCs used to be clunky slabs that boasted built-in compatibility with Microsoft applications, but the X50v has devastatingly sleek looks and plays video better than some portable video players we've tried. Ounce for ounce, which PDA serves PC power users better? Read on, pilgrim.

—LOGAN DECKER

palmOne Tungsten T5

Hardware: palmOne's flagship packs a 416MHz Intel XScale proc and an extremely generous 256MB of internal flash memory, of which 160MB is available to the user. Cleverly, the T5 includes new Drive Mode storage, which allows you to plug the PDA into any USB port on any PC and access the internal flash memory—including the PDA's SD card storage—just as easily as you would with a USB key. There's an SD card slot for expansion, and both the D-pad and the buttons feel great, offering perfect resistance. The exterior is plastic with a metallic finish, but still looks fantastic. The 320x480 screen is flawless, and at its maximum setting appears very bright—at least until it's compared side-to-side with the X50v. Battery life clocked in at 4:15 (hours:minutes) playing looped video at 75 percent brightness; unfortunately, the battery is not removable. **Winner: X50v**

Software: The T5 would have made an ideal launching pad for Palm's upcoming OS 6, known as Cobalt. But no, it runs Palm OS 5 (Garnet). It includes *Documents to Go* for importing and exporting your Microsoft *Office* files (*Word, Excel* and *PowerPoint*), and *RealPlayer* for media playback, which doesn't support *WMA* tracks. There's a smattering of "productivity" apps for expense reports and what-not. **Winner: X50v**

Connectivity: The T5 ditches the T3's "universal" connector in favor of a new T5-to-USB "multi-connector" cable (a cradle kit is a $50 option). Only Bluetooth is integrated into the T5; for Wi-Fi, you'll need to purchase the optional SD-card adapter for $130, which will occupy your only expansion slot. **Winner: X50v**

Ease of use: Surprisingly, the T5 crashed on us twice during testing. The X50v never did. The Palm OS still has the ease-of-use edge, but Dell has thrown in enough improvements on the Windows Mobile OS to make this one a tie. **Winner: Tie**

MAXIMUM PC VERDICT 7

PALM TREES

Swift proc, tons of RAM, and unique "drive mode."

HAIRY PALMS

No Wi-Fi, and expensive for what you get.

$400, www.palmone.com

Dell Axim X50v

Hardware: Intel's 624MHz PXA270 XScale is the fastest proc on the block. The X50v makes 62MB of memory available to the user, and another nonvolatile 91MB is available for file storage. We're delighted to see the return of a CompactFlash slot alongside the SD card slot. But the big story is the X50v's bold and super-bright hi-res 480x640 screen. This is backed up by Intel's 2700G graphics accelerator, which has its own 16MB of VRAM. Even though applications and games will have to be recoded to take advantage of the 3D acceleration, this is a welcome step forward for handhelds. The battery lasted 2:20 (hours:minutes) playing looped video at 75 percent brightness; In everyday use, the X50v lasted longer than its X30 predecessor, so we suspect the graphics accelerator is a bit of a power hog. But the removable battery allows you to carry a spare or swap in the optional high-capacity unit. **Winner: X50v**

Software: Runs Windows Mobile 2003 Second Edition. Bundles *Outlook 2002*, *Pocket Word*, *Pocket Excel*, and a version of *Windows Media Player 10* optimized for the X50v's graphics acceleration. The results, at least with files supported by *WMP*, are stunning. We're talking unbelievably smooth video with no stuttering. Also includes optimized versions of two games: *Enigmo* and *Stuntcar Extreme*. **Winner: X50v**

Connectivity: The X50v connects via a proprietary connector-to-USB cable, and you can access the internal flash memory on any PC with ActiveSync installed. The X50v integrates Bluetooth and Wi-Fi, although we noticed that the X50v's Wi-Fi has slightly less range than the previous model, the X30. **Winner: X50v, by a mile**

Ease of use: Dell has wisely improved upon Windows Mobile 2003 Second Edition in a number of ways. The *Switcher Bar* allows you to completely close applications with two clicks instead of just minimizing them, and a power adjustment applet allows you to easily throttle up and down the proc speed to extend battery life. Hopping onto Wi-Fi networks is a breeze. **Winner: Tie**

MAXIMUM PC VERDICT **9**

+ ACTIVESYNC

Beautiful video playback, graphics accelerator, and hi-res screen.

– COLONEL KLINK

Slightly less Wi-Fi range than the X30, and power hungry with games.

$500, www.dell.com

The Upshot

It was tough watching the competent and innovative Tungsten T5 take such a brutal beating from the exceptional X50v, but that's life. It appears that as palmOne's most advanced handhelds have become more sophisticated, they've begun to lose their edge in terms of ease of use, and still can't approach the versatility of Pocket PC. Will palmOne ever be able to catch up? We're not sure, but we're waiting ringside.

WatchDog

Say hello to Gypsy, WatchDog of the Month

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

>Essential Computers >SilentMaxx >nVidia >Toshiba

Non-Essential Computers

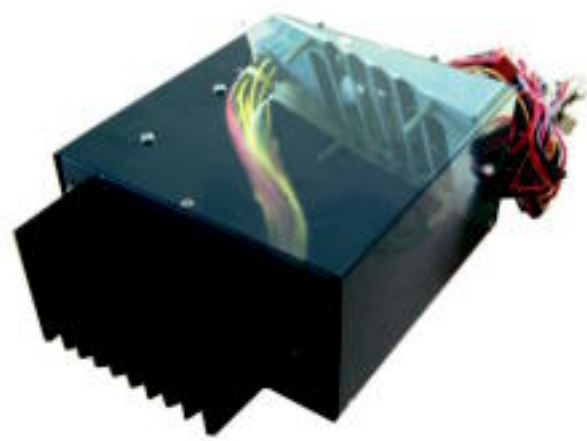
DEAR DOG: Essential Computers, a fine web-based retailer, doesn't seem to be in business anymore. While its web site, **www.essencompu.com**, can be accessed, you can't do anything on it. It's like the lights are on but nobody's home. The only time I ever came close to having a problem with the company was when a CPU I wanted to buy had to be back-ordered. But it was delivered to me in a reasonable time when it became available. Otherwise, I've always gotten exactly what I ordered at good prices.

—HOWARD CHAN

SilentMaxx a Little Too Quiet

DEAR DOG: In December 2003, I purchased a SilentMaxx Fanless power supply for $240 directly from SilentMaxx.com. A couple of months ago, the PSU died. According to its web site, the PSU has a one year warranty. Since then, I have tried multiple times to contact SilentMaxx, but to no avail. I have tried contacting the company via e-mail (no response), phone (no answer), and through its web site (no luck).

> *"IT'S LIKE THE LIGHTS ARE ON BUT NOBODY'S HOME."*



SilentMaxx.net has shut its doors, but the German-based company hopes to sign another vendor to distribute its products again.

THE DOG RESPONDS: By all indications, Essential Computers of College Point, New York, is dead meat. At press time, EssenCompu.com was still offline but it was obvious from complaints on ResellerRatings.com as early as last summer that the company was going under. Up until May, many users rated Essential as a reliable web store for PC components. But just one month later, consumers started reporting problems obtaining orders, getting refunds, and having orders mysteriously cancelled. One consumer wrote: "I have purchased from this seller three times before with great results, until recently, when I ordered a Radeon 9600XT graphics card and a free mouse pad (for return customers). It was supposed to be two-day shipping, but it took seven days for my package to arrive. And I only received the mouse pad! No graphics card. I've been leaving messages with customer service and sending e-mails, but I have not been able to get in contact with anyone. I'm getting a bad feeling about this...."

When the Dog tried to call the company, most of the numbers for it were disconnected, and in a more ominous sign, a phone call to the owner of the company also resulted in a disconnected number. So it's probably safe to assume that Essential Computers is essentially dead. Woof.

According to SilentMaxx's web site, I cannot return the PSU for replacement without an RMA. However, no one there ever returns my queries. I'm worried I'm stuck with a dead PSU and I won't get a response from SilentMaxx before the one year warranty expires.

— KEVIN TATTERSON

THE DOG RESPONDS: Kevin's e-mail was the second we received complaining about service from SilentMaxx. Another reader reported never receiving product after ordering and paying for it on SilentMaxx.net (that's right, .net). While the .com site continues to live, the .net site has all but disappeared. We managed to contact a spokesman for SilentMaxx.com in Germany who said the .net site was an authorized reseller that had permission to use the SilentMaxx name but was not a subsidiary of the German company. "This company is now closed and we have lost a lot of money to this company," the spokesman said.

SilentMaxx.com is in negotiations with another U.S. company to carry its products. The spokesman offered to RMA the power supply for Kevin, but because he purchased it from Germany, the cost of shipping the power supply overseas probably isn't prudent. Instead, the spokesman suggested that the reader exchange the power supply when SilentMaxx's new U.S. partner is online.

Is My 6800 Only Good for Gaming?

DEAR DOG: There seems to be quite a bit of noise on various message boards claiming that the video features on nVidia 6800 GPUs don't work. To quote nVidia's web site: "Another important factor is that the GeForce 6-series GPUs are completely programmable and can handle formats such as WMV9 and MPEG-4. The nVidia motion compensation engine can provide decompression acceleration for a variety of video formats including WMV9, MPEG-4, H.264, and DivX. As with motion compensation for MPEG-2, the nVidia video engine can perform most of the computation-intensive work, leaving the easiest work to the CPU."

This testimony was a major factor in my decision to buy a 6800-series card. But now everyone is saying the card cannot do what the company said it could. Am I, along with many others, stuck with just a great gaming

> ***"AM I, ALONG WITH MANY OTHERS, STUCK WITH JUST A GREAT GAMING CARD?"***

card? If anyone can get to the bottom of this, it must be you. Thank you in advance.

—JONATHAN HAYTON

THE DOG RESPONDS: The Dog contacted an nVidia spokesman who cleared up the confusion over this issue. He said the 6800 does indeed include the advanced video support that's touted on the web site, but consumers must download a newer set of drivers that was made available at the end of November.

According to the spokesman: "nVidia is also working with application vendors to take advantage of the programmable encode features of the GeForce 6800 and 6600. Just like programmable pixel shaders when they were first introduced, this requires additional collaboration with application vendors. The first application that nVidia is targeting to support its GPU encode capabilities is Windows Media Center Edition 2005.

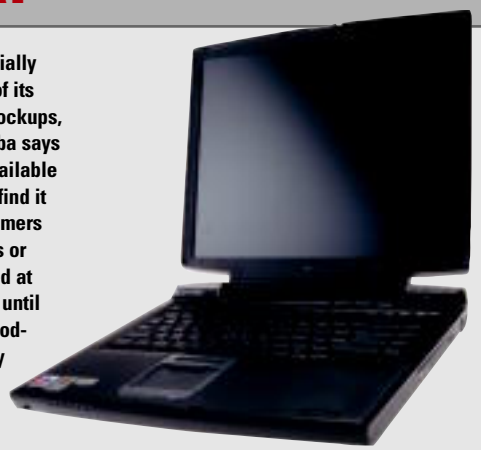
"You only need nVidia's DVD decoder if you want the advanced post-processing features (i.e. motion adaptive de-interlacing and inverse 3:2 pulldown), in addition to hardware MPEG-2 decode.

"For MPEG-2 decode only, any application built on DirectShow can take advantage of the hardware decode in the 6800 and 6600 as long as they access the hardware through DirectX Video Acceleration. *WinDVD*, for example, can take advantage of nVidia's hardware decode."

There is one difference between the 6800 and the newer 6600 core, though; and that's how the two cards handle Windows Media Video 9 hardware acceleration. nVidia says the 6600 does more offloading when playing WMV9 content than the 6800 is capable of, but the 6800 does do some acceleration. ■

RECALL ALERT

Toshiba is alerting its customers of potentially bad memory modules in some 25 models of its notebooks that may cause blue screens, lockups, and undetected memory corruption. Toshiba says the risk is low, but it has made a utility available to consumers to detect the error; you can find it at www.toshibadirect.com/utilityCEP. Consumers can opt to replace the memory themselves or to return the notebook and have it replaced at Toshiba's service center. Consumers have until April 30, 2005 to obtain the replacement modules. For more information consumers may call Toshiba at 866.544.1325 or visit: www.toshibadirect.com/content/pc/b2c/CEP.html for more information.



The affected notebooks include:

- **TECRA S1, 9100, M1, M2**
- **Satellite 2400, 2405, 1110, 1115, M30, M35**
- **Satellite Pro M10, M15, M30**
- **Portege R100, M200, M205**
- **Dynabook T5, E6, V7, SS S7, SS 2100, E7, V8, V9, VX1, SS M200, Dynabook Satellite M10**

Hewlett-Packard suffered a similar memory module problem last summer and was forced to replace modules in some 900,000 Compaq Evo, Compaq Presario, NX7000, and Pavilion ZT3000 notebooks.

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic the Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

READING INTO THE FUTURE

Ultimately, we did it for science. The cackling, crusty, Lab technician beckoned us into his workspace—an unused area of the Maximum PC Lab that had been covered by boxes and discarded LCDs for years. Where did this guy come from? And how long had he been here?

Not even Senior Editor and Maximum PC Lab historian Gordon Mah Ung knew the answer.

Undaunted, we followed the mysterious stranger into the bowels of the Lab. Past the Pentium IIs, the Sound Blaster soundcards, the 486 rigs. The Newton. We arrived at a simple folding table with a stack of odd-looking tarot cards on top of it.

"Now let's see if you can make heads or tails of this, my friends." The Lab technician flipped over the first card. Associate Editor Josh Norem emitted a shrill, high-pitched scream and fainted the moment he saw the card's face.

Three hours later, we slowly regained consciousness. Was it all some crazy dream induced by the morning's Krispy Kreme binge? Apparently not. Scattered around us lay 10 pages of scribbled notes—and a stack of the old geezer's tarot cards.

These notes formed the basis of the following story. Read on for a detailed explanation of 2005's most important technologies. We're talking names, numbers, and the greater meaning of it all.

OUR EXPERTS DIVINE THE YEAR'S 19 MOST PROMISING TECHNOLOGIES

Tarot Illustrations by Phil Bliss

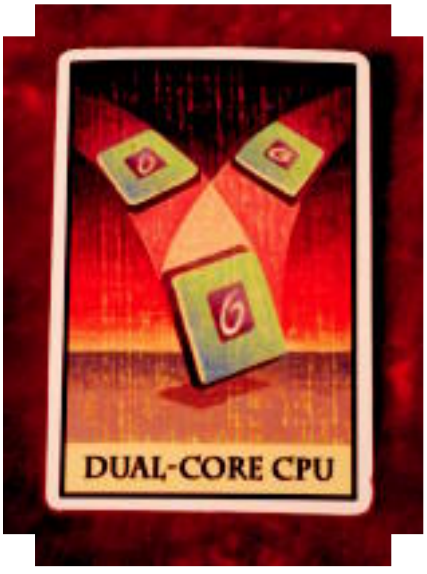
Dual-Core Processors

AMD and Intel race to give you two CPUs for the price of one

This year, AMD and Intel will commence one of the biggest and most interesting architectural changes in PC history: Manufacturing the first processors that integrate two CPU cores into a single unit. This development will essentially give users twice the processing power, but without the extra price of buying two physical processors, two heatsinks, and an expensive two-processor motherboard.

While it's true that, upon the debut of dual-core, the vast majority of applications won't be able to take advantage of multiple CPU cores, we will still see a benefit in overall performance. As an example, one core will be able to handle all the needs of the OS, while the other core can perform a completely separate task, like encoding a movie.

Intel first broke ground on the dual-core concept back in 2002 with its Hyper-Threading technology, which presupposes that few applications simultaneously use all the resources of the CPU core, so why not make use of the extra resources for something else? The weakness of Hyper-Threading is that while the OS gets fooled into thinking it has two CPUs, it only has the resources of a single CPU to work with. If you throw two floating-point heavy apps at an HT CPU, it may actually run slower as both programs vie for the same resources.



"AMD and Intel will commence one of the biggest and most interesting architectural changes in PC history..."

AMD's Plans

When they debut this summer or fall, dual-core processors will have two physical cores, each with its own set of available resources. This means you'll be able to throw two floating-point apps at the CPU without bogging it down.

Despite the fact that Intel showed off consumer dual-core CPUs first, AMD is expected to beat Intel to market. The company recently demonstrated a dual-core Opteron CPU with each core sporting its own 1MB of L2 cache. While AMD hasn't released any specifics for its consumer dual-core CPU, code-named Toledo, we suspect it will be similar in architecture.

We're curious to see how AMD deals with the on-die memory controller that has been such a boon for performance in its CPUs. AMD will continue to use the controller, but in a dual-core configuration, both processor cores will have to share the memory controller. AMD likely made this choice in order to maintain compatibility with existing motherboards, and because of cost. A dual-core CPU with dual memory controllers operating in dual-channel mode would require consumers to populate four separate channels just to get the machine up and running. That's costly. It's not clear at this time whether the shared memory control will heavily offset the overall performance gain.

AMD says its Opteron dual-core will drop into most Socket 940 motherboards, which implies that the same will be true of Toledo and most Socket 939 motherboards.

Intel's Big Plans

Intel has been extremely secretive about its dual-core processor, but it's been widely speculated that it will be based on the Pentium M core. We talked to some anonymous sources at Intel and learned that the public dual-core demonstration the company recently gave was running on the 915 chipset. This strongly suggests that the CPU involved was P4-based.

Word on the streets is that Intel's first dual-core proc, code-named Smithfield, will be two conjoined 90nm Prescott cores, with plans to eventually move to a Pentium M-based architecture.

Even though there's no on-die memory controller to be shared among Intel's dual-core chips, Smithfield will still have to share the bus and memory controller if it plugs into the existing 915/925XE chipset. However, by the time Intel's dual-core launches, it's quite possible its new chipset, code-named Lakewood (or Lakeport), will be available and able to address the situation.

A little birdie told us that Intel's top-secret five year plan is to leverage multi-core processors to re-enter the real-time gaming graphics market. It sounds crazy when you consider that current games, which aren't multi-threaded, won't see large performance gains on multi-core CPUs. But if the trend moves toward Renderman-style software renderers—running on lots of general purpose CPU cores, similar to the PlayStation's Cell architecture—the entire industry could shift away from ATI and nVidia-style discrete graphics processors. Naturally, this isn't possible until CPU manufacturers are shipping eight or 16 CPUs on a single die. Could it happen? Who knows? With its back up against a wall, Intel could surprise us all.

Possible Downside: Power Consumption

One encouraging sign in both companies' early demonstrations is the possibility that both dual-core CPUs *may* work in existing motherboard designs.

Unfortunately, it's likely this new generation of processors will demand more power. Each core requires its own power, so dual-core CPUs may necessitate bigger power supplies. So while the CPUs may work with existing chipsets, they'll only work with motherboards that can handle the additional power requirements.

When dual-core CPUs are finally released, we'll all know more, but this much is clear: Performance and processing power aside, the dual-core proc will be a key ingredient—a vestigial limb of sorts—in the future evolution of the PC platform.

OLED

Thin is in, and bright is right

It's not quite the photo-printer you have at home, but Philips' PolyOLED uses similar inkjet technology to squirt red, green, and blue sub-pixels onto a rigid surface.

Everyone's dumping their fat-ass CRTs in favor of thin and light LCDs, and manufacturers are cheerfully cranking out models with bigger viewing areas, faster response times, and lower prices. But peek into the R&D clean rooms of many LCD makers and you'll find they're quietly ramping up production of the next generation of display technology—one that promises richer colors and thinner packages at lower prices than today's LCDs.

The technology is called Organic Light-Emitting Diode, or OLED, and primitive versions are already shipping in products today, such as MSI's MEGA line of MP3 players and Samsung's E71x series of cellphones. One of OLED's intrinsic advantages over today's thin-film transistor (TFT) displays is that displayed data remains crisp and legible even in bright sunlight and/or with the screen held at sharp angles. But these modest two- and four-color displays are only a hint of what's to come.

One of the most aggressive pioneers of OLED technology is LG Philips, which is currently showing off the world's largest OLED display—at 20.1 viewable inches—on the trade show circuit. OLED fever is also catching on quickly with other manufacturers—including Sony, DuPont, Kodak, and Samsung. Undoubtedly, these companies appreciate the fact that, in mass production, OLED displays will be cheaper to manufacture than traditional liquid-crystal displays. In contrast to the complicated process of layering rigid materials for LCDs, the red, green, and blue sub-pixels of OLED displays can be literally sprayed onto a substrate in a *single step* using precision inkjet printers. No, we're not making this up.

Cheaper production means cheaper products for consumers, and the fun doesn't end there. Because the pixels in OLED displays emit their own light, they don't need backlighting like today's thin-film transistor (TFT) displays. Consequently, OLED displays should require less power and result in longer battery life for portable devices. As if this weren't enough, the research and white papers we've reviewed seem to indicate that the real advantage of the technology is its potential to reduce screen thickness and weight. This means digital cameras with bigger displays, thinner PDAs, portable video players no bigger than an iPod, and desktop monitors one-third the thickness of today's LCDs.

While we don't expect to see an affordable 20-inch OLED display on our desktop this year, we do anticipate portable electronics with 16-bit color OLED displays to show up by the holiday season.

DDR3 (and faster DDR2)

Our prognosis: RAM upgrading continues to be murky

If you've been a PC geek long enough to remember the original release of DDR RAM, you probably remember that it was a wild ride that left consumers dazed and confused as speeds jumped from DDR166/200 to DDR266, DDR333, and DDR400. That's not even counting dual-channel iterations. Because each bin speed required a new chipset, you had to toss your motherboard if you wanted to use the faster RAM to its full potential.

It looks like DDR2 will suffer the same problem this year as we see the release of DDR2/667 and DDR2/800 versions. But to confuse (and tantalize) you just a little more, the organization that homologates RAM specs and speeds is expected to unveil DDR3 at the end of the year. Not much is known about DDR3, but we expect it to continue the trend of lowering voltage and increasing speed. That's a good thing.

One of the interesting byproducts of this rapid evolution is that in 2005, AMD should finally be forced to switch to DDR2 in its Athlon 64 CPUs. Because the memory controller is integrated into the CPU and only supports DDR, there's been no way to build a DDR2 Athlon 64/FX system. We're predicting that AMD will add DDR2 support later this year once the spec settles down at the DDR2/800 speeds.

Finally, to add even more chaos to the situation, we've heard talk of an attempt to get an official DDR500 spec pushed through. Although it's a commonly held belief that DDR400 was the absolute end of the line for DDR, several DRAM manufactures are producing chips that can reach the higher margins. Popular among overclockers, it remains to be seen whether the obsolete tech will receive continued support from the industry.

SERIAL ATA SPEC

Faster! Stronger! Smarter! (And more connected)

The Serial ATA specification is constantly being worked over and improved upon, and in 2005, it will receive a drug-free injection of cool new features. Let's take a look.

DOUBLE THE SPEED

Though the Serial ATA interface is still relatively new, it's already in line to receive a massive bandwidth upgrade for 2005. Its current specification allows for up to 150MB/s, which will soon increase to a staggering 300MB/sec. This is good news for power users, as the extra bandwidth will ensure that no matter what kind of storage system you're running, your drives will *never* be constrained by the interface. We expect SATA 300 drives to be available by mid-2005, though SATA 150 drives will continue to be sold throughout 2005 as well.

Image courtesy of Molex

Serial ATA cables are notorious for popping out of their ports. This connectivity problem will be remedied soon thanks to an all-new latching connector.

A LATCH MADE IN HEAVEN

Anyone who's built a system with SATA drives has probably been frustrated by the tentative, limp-wristed connection between the cables and the port on the mobo, so we're tickled pink by news of an all-new SATA cable for 2005. This new cable includes a latching connector that "clips" into the port for an extremely solid connection. Both data and power cables will receive this upgrade, which will be available at the beginning of the year.

NATIVE COMMAND QUEUING

We spoke highly of this fledgling technology in last year's tech preview, and it's just now becoming a reality. When supported by both the hard drive and the host controller, it allows the drive to create a queue of up to 32 requests and execute them in the order it deems most efficient—based on the proximity of requested data to the current position of the read/write heads. This performance-enhancing technology is already present in Intel's new 915/925 chipset and will also be included in nVidia's upcoming nForce4 chipset. Several drive makers are also currently shipping NCQ drives, notably Maxtor and Seagate.

EXTERNAL INTERFACE

The original SATA specification did not include an external spec, but in early 2005 we'll see this new technology hit the market. The main benefit is the possibility of external drives that are just as fast as your internal drive, if not faster (if you have an older PATA drive, that is). Currently, external USB and FireWire drives are handicapped by the limitations of the bus. While external SATA drives won't offer the same level of universal compatibility afforded by USB or FireWire drives, they'll be at least twice as fast. That's reason enough for us to get excited.

PORT MULTIPLIER

This technology will allow a single SATA port to connect to up to 15 drives, although the most common implementation will run four ports off of a single port. This won't be an add-on device or a piece of hardware, but rather logic built into the SATA host controller. Only newer SATA host controllers will support the use of port multipliers. As of this writing, the only next-gen controller with support is Intel's new Advanced Host Control Interface (AHCI), which is part of its 915/925 chipset.

The most likely use of this advancement will be external storage enclosures, where you'll be able to purchase a four-drive array that can be connected to your PC with just a single SATA cable.

HOT-SWAPPING

Though hot-swapping was not implemented in the original SATA specification, we expect it to be part of the advanced SATA features implemented in the near term. Hot-swappability will make a SATA drive just like a typical USB or FireWire device, in that you can plug and unplug them to your heart's content with the system running. This will mostly be useful for external devices, but people running large capacity RAID arrays will certainly be interested in it as well. At press time, little information was available on this feature, so we bet it will arrive in late 2005.

WHAT EVER HAPPENED TO...?

You may want to avert your eyes—in some cases, the news ain't pretty

LIQUID CRYSTAL ON SILICON: In last year's tech preview, we talked about Intel's new LCoS tech—it stands for liquid crystal on silicon—which promised to cheaply make huge LCD displays by using chip fabrication techniques to build the displays. Unfortunately, it didn't work out. In October, Intel announced that the LCoS program was dead.

BTX: BTX is still alive, but it's moving along at a slower pace than Intel predicted. (Last year, we said it would be a slow roll-out.) BTX makes a lot of practical sense, but the PC industry is taking its own sweet time. Though it was officially released in November, we don't expect to see any real momentum behind the spec for another six months.

LONGHORN: It's still coming. Initially slated for late 2005, Longhorn was pushed back into 2006 early last year. In order to make that deadline though, Microsoft has had to put off support for the WinFS database-based filesystem until after Longhorn's launch.

BLUETOOTH: Bluetooth cellphones are selling like hotcakes, but Bluetooth is all but dead on the PC. Its puny 2Mb/s transfer rate is simply too anemic to be useful. The recent announcement that Bluetooth transfer rates will triple leaves us feeling flat, given that it's going to take three years to go from slow to slightly less slow.

10 GIGABIT ETHERNET: Sometimes, even Gigabit Ethernet just doesn't cut it. For those special times, the power user with a severely overstuffed wallet can turn to 10 Gigabit Ethernet, which is roughly 10 times faster than normal Gigabit. Of course, this speed comes at a huge cost. 10GbE cards still cost about $5,000 (each) and use unwieldy fiber optics instead of the twisted-pair copper cable that Gigabit uses.

ATI's R480 and R430

Re-spin the silicon for higher clock speeds and higher yields

You can expect a new series of videocards from ATI starting in December 2004. These cards aren't entirely new cores—after all, the R420 core that powers current X800 boards is only six months old. But they will be enhanced with faster clock speeds, and the changes will result in faster high-end 3D performance.

Dubbed Radeon X850, the R480-based boards will replace the current Radeon X800 fleet and come in three flavors: Radeon X850 XT Platinum Edition, Radeon X850 XT, and Radeon X850 Pro. Both of the X850 XT cards will use a dual-slot cooling solution similar to nVidia's GeForce 6800 Ultra boards. Flat-panel fans take note: The X850 XT Platinum Edition and X850 XT will both feature dual DVI outputs!

On the midrange front, it appears that the new R430-based boards—the X800 XL and X800—will be the first real competition for nVidia's GeForce 6800 GT line. Because of its 0.11-micron process and 16 pipelines, our expectation is that the Radeon X800 XL should perform nearly as well as the X850 XT when overclocked.

None of the new ATI boards support Shader Model 3.0; this isn't a huge shortcoming because only a handful of games support it. While the number of Shader Model 3.0 games will likely increase in 2005, it's probable that by the end of the year the spec will still not have reached critical mass.

We have yet to receive any of these boards for testing, but based on the specifications, our Lab estimates that the high-end X850 XT Platinum Edition boards will exhibit between 5 and 10 percent faster performance than current X800 XT Platinum Edition cards. Time will tell for sure.

SPEC SPEAK: How ATI's new videocards match up

	RADEON X850 XT PLATINUM EDITION	RADEON X850 XT	RADEON X850 PRO	RADEON X800 XL	RADEON X800
PIPELINES	16	16	12	16	12
PROCESS SIZE	0.13-micron	0.13-micron	0.13-micron	0.11-micron	0.11-micron
CORE CLOCK	540MHz	520MHz	520MHz	400MHz	400MHz
MEMORY CLOCK	590MHz	540MHz	540MHz	490MHz	350MHz
MEMORY TYPE	256-bit GDDR3	256-bit GDDR3	256-bit GDDR3	256-bit GDDR3	256-bit GDDR3
MEMORY SIZE	256MB	256MB	256MB	256MB	128MB, 256MB
PRICE	$550	$500	$400	$350	$250

nForce4 SLI

nVidia's revolutionary mobo may make it a bad year for Intel

A lot of hype has developed around nVidia's new chipset, and from what our early Lab tests have indicated, it's well deserved. The nForce4 SLI chipset could change several dynamics in the PC universe. First, it will be the first chipset to give consumers an affordable and practical option for easily achieving a significant boost in 3D performance. Here's how: If you can't afford two GeForce 6800 GT cards today, you can just buy one now and then when the price has plummeted, buy a second card and enable SLI.

Because SLI is an nVidia technology, we expect it will work best with the nForce4 chipset. Here's an interesting thought: If SLI becomes the de facto standard for power users, Intel could be left empty-handed in the high-end market because it doesn't have a chipset that supports dual-videocard technology.

Open Source Software

2005 is the year open source goes mainstream

One of the biggest surprises of the last few years has been the incredible success of Mozilla's lean-and-mean *Firefox* web browser. When *Maximum PC* first mentioned *Firefox* in November 2003—it was called *Firebird* back then—the alternative browser was so far under the radar, it was on sonar. Since then, *Firefox* has become the browser of choice for the techno-elite, with some geek-friendly sites showing 20 percent of their traffic from *Firefox* users.

The secret to *Firefox's* success is a one-two punch of a simple, easy-to-use interface, and a plugin architecture that lets anyone add functionality to the browser. This stands in stark contrast to traditional open-source apps, which offer tons of functionality, but sport intimidating and difficult-to-use interfaces that scare novices.

Our prediction: In 2005, many open-source developers will follow *Firefox's* lead and build more accessible apps, while still catering to power users with advanced plugins.

We think *Firefox's* 1.0 release will usher in a new era of easy-to-use, open-source applications.

802.11n

Will an early debut taint next-gen Wi-Fi?

Today, 802.11g Wi-Fi networks are commonplace, but they're plagued by the same shortcomings that plagued earlier 802.11b networks—namely poor performance and high overhead. Even though 802.11g networks are rated at 54Mb/s, we rarely achieve data transfer rates faster than 25Mb/s in real-world test conditions. The upcoming 802.11n spec aims to remedy these problems and promises performance equivalent to wired 100baseT Ethernet.

There are two radically differing techniques being considered to reach these high performance goals: using larger chunks of the radio spectrum, and using multiple transmitters and receivers for each connection.

Right now, you're probably thinking you're not going to see 802.11n-based hardware in 2005, and you're right. What you will see is "pre-N" hardware. Because we don't expect the IEEE (Institute of Electrical and Electronics Engineers) to deliver a final 802.11n spec until late 2005, at the earliest, a few hardware vendors are jumping the gun and releasing hardware based on one of the competing but incompatible specs.

Unlike the pre-spec 802.11g hardware, which could be upgraded to the final spec with a simple firmware update, the pre-N hardware is unlikely to be firmware upgradable to the final spec. This means that anyone who purchases pre-N hardware could be left in the cold when the official 802.11n hardware arrives in 2006.

(We review the first Belkin Pre-N router on page 81 of this issue.)

WiMax

Wireless broadband works toward widespread adoption

Let's face it, Wi-Fi is great for wireless access inside your home or office, but it just doesn't have the range to cover major metropolitan downtown areas or large suburban areas. If you want wireless Internet access anywhere and everywhere, the best you can hope for is a super-slow cellphone connection. WiMax promises widespread wireless broadband for everyone.

Current over-the-air broadband is a mess. There are dozens of proprietary specs in use around the world, and few of them interoperate with each other. Many of them even require line-of-sight with the transmitter, prohibiting their use in hilly areas or for mobile users.

WiMax, on the other hand, delivers high-speed connections over a large area—we're talking a three mile radius—using open hardware standards, and without any line-of-sight requirement. This means that one day soon, you'll be able to plop down on a park bench, open your laptop, and have a blazing-fast, DSL-speed connection any time you want.

Currently being tested in Seattle, WiMax should see wide release in late 2005.

Wireless USB

And that spells curtains for Bluetooth

Sensing, perhaps, that Bluetooth implementation on the PC hasn't been an overwhelming success, Intel has formed a working coalition to create a specification for a Wireless USB standard. This group's intention is to *begin* with the full 480Mbps bandwidth of USB 2.0 at up to 10 meters distance. That's 60 megabytes per second—plenty of headroom for your keyboard, mouse, portable hard drive, and webcam (if you're still into that).

But get this: There's a competing standard developed by Cypress Technologies called WirelessUSB (no space between the words), which operates in the familiar 2.4GHz band and provides less bandwidth than Bluetooth—217.6Kbps, to be exact. That's enough for your keyboard and mouse, but not the webcam or portable hard drive.

Cypress Technologies may have a head start on the hardware, but would it be rude of us to say we'd rather wait for Intel's take on the wireless PC? Perhaps, but we'll take either protocol over Bluetooth.

Mesh Networks

Buzzword or buzzworthy? We'll find out in '05

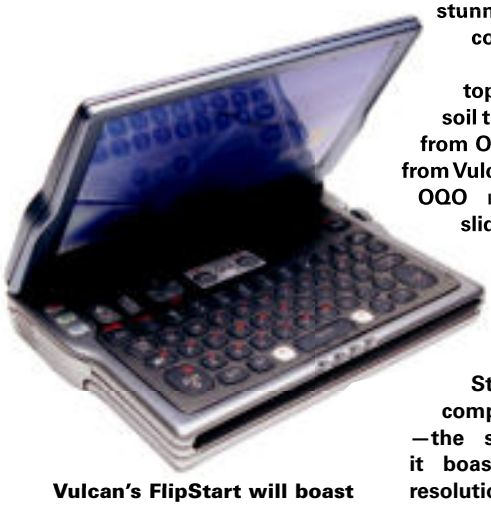
Every day, you connect to dozens of networks. You connect to web servers, e-mail servers, file-sharing servers, print servers, and FTP servers. All of these connections are client/server based, meaning you (the client) connect to a centralized server that contains your information. Even peer-to-peer file-sharing services like Kazaa and Bittorrent rely on a central server to get all the clients talking to each other.

But there's another way. Mesh networks are wireless networks that use special protocols to connect computers and other devices in close proximity to each other without requiring any kind of central server. Mesh networks are being considered for everything from highway safety projects—say, a driver's airbag deploys on the freeway, the car sends a signal to all other vehicles nearby warning the drivers to slow down—to eradicating dead spots in home wireless networks.

Handtop PCs

2005 will finally bring full-powered personal computing to the palm of your hand

The idea has been around for years: a pocket-size PC running the full version of Windows XP that replaces your desktop, laptop, and PDA. Antelope's Modular Computing Core—a paperback book-size slab that was an expensive paperweight until connected to an external monitor, keyboard, and mouse—was an early stab at the concept. Then Sony's VAIO U50 stunned us with its 5-inch integrated touch screen, support for external resolutions up to 1600x1200, and elegant design. We were just as stunned when Sony discontinued it.



Vulcan's FlipStart will boast the highest resolution screen of any handtop PC.

But two more handtop PCs will grace U.S. soil this year: The model 01 from OQO, and the FlipStart from Vulcan. The just-launched OQO model 01, with its slide-up screen and luscious, mellow finish makes the FlipStart look like a dumpy hausfrau. But the FlipStart owns its sexy competitor where it counts—the specs. At 1024x600, it boasts a higher native resolution than the OQO (at 800x480), a bigger screen (5.6 inches vs. 5 inches), and a larger internal hard drive (30GB vs. 20GB).

Desktop, laptop, and PDA: OQO's model 01 is one of the first of a generation of technological cross-dressers.

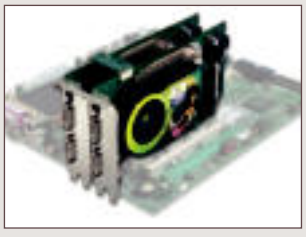
Neither PC will give you *Half-Life 2* on the go, but you will get low-end laptop power and instant-on capabilities in a footprint that won't leave your back and shoulders aching.

nVidia's SLI

Will multiple-videocard rigs blossom because of nForce4?

Last month, we tested the first nVidia dual-videocard rig we've seen in the Lab since the days of the 3dfx Voodoo2. Unfortunately, the performance of the SLI (scalable link interface) system we tested last month was limited by the E7525 chipset, which is designed for servers and uses slower, registered RAM. At the time, it was the only chipset that supported dual PCI Express slots suitable for videocards.

If you missed out on last month's story, here's a quick recap. By using a motherboard that sports two PCI Express slots—such as the nForce4—nVidia is able to combine the resources of two videocards to render a single scene. This results in a performance increase of up to 85 percent, although most real-world games are constrained by the CPU's performance before reaching the full benefits of dual videocards.



If nVidia's dual-videocard gambit succeeds, it will be because of the nForce4 chipset—Intel's chipsets simply don't have the legs for SLI.

VERIZON'S FIOS

Presenting yet another benefit of a high-fiber diet

Verizon is expanding the trial run of its fiber-optic broadband service to more cities throughout our glorious nation. For a trifling $40 a month, subscribers can gorge themselves on a 5MB downstream/2MB upstream connection—options go up to a fat 30MB/5MB pipe for $200 a month.

Verizon's terms of service, however, warns: "You may not use the Broadband Service to host any type of server, personal or commercial in nature." This is common among ISPs and rarely enforced, but if you're lucky enough to be squatting in a city where FIOS service is available, well—caveat emptor.

Audigy 4—and More

Creative may be the last bastion of audio acceleration

If it weren't for Creative, PC audio technology might have wound up in the dead tech sidebar on page 34. nVidia has thrown in the towel. Philips cried uncle earlier this year. And ESS no longer responds to our phone calls. Indeed, audio acceleration has gone from a thriving segment to Palookaville in just five years.

With Intel's 24-bit host-based HD Audio spec a reality, discrete PC audio has just one champion left: Creative Labs. Love it or hate it, Creative is the only player still committed to building soundcards that offload processing work from the CPU. Creative didn't release any bombshells this winter, save the announcement of an upgraded Audigy 2 ZS card named Audigy 4 that increases the signal-to-noise ratio from 108dB to 113dB. The card's DSP is the same, but Creative is adding better digital audio converters and an external box to the mix.

Finally, although he declined to specify details, a spokesperson told us the company is committed to audio acceleration and is working on an entirely new audio architecture for 2005. We don't have any hard facts yet, but our guess is that the upcoming architecture will include a new version of EAX, Dolby Digital encoding at the hardware level, and all the intellectual property Creative amassed when it bought defunct soundcard maker Aureal and audio designer Sensaura. We doubt Creative will resurrect Aureal's Wave Tracing technology, which used geometry to calculate audio in a 3D environment, but we can see Creative integrating Sensaura's Virtual Ear technology, which lets you fine-tune 3D audio for your own ears.

8X DOUBLE-LAYER DVD BURNING

8.5GB + 15 minutes = 1 finished disc + 1 happy PC upgrader

Writing 8.5GB to a double-layer disc in about 12 minutes: Sounds good, but will it happen? We think so. In fact, we bet that R&D testing is taking place at top-secret labs even as you read this. But manufacturers would be loathe to admit it, lest you choose to wait for burning speeds to increase before buying a double-layer DVD burner.

In fact, from what we've heard, one manufacturer's existing 4x medium may be able to tolerate 8x write speeds without requiring a new dye formulation. If this holds up—and it sounds like it will—you can expect a gold rush of 8x double-layer DVD burners this summer. Just remember that while the drives may be cheap, the media won't be.

HD-DVD and Blu-Ray

Blu-Ray and HD-DVD divide the nation

Imagine if this past year's presidential election didn't have any end-point. The final vote would occur, well, whenever. That's where we're at with Blu-Ray and HD-DVD as each vies to become the next optical drive storage standard for data and high-definition video. Both sides are building support, but neither has pulled ahead far enough to close the deal with consumers.

We think one of them has a definitive lead.

In Japan, where HDTV already has a firm footing, television junkies are dropping $3,000 for Sony's first Blu-Ray recorder. But prices are sure to drop as more models are released.

Toshiba's HD-DVD has a nice sell. The physical disc structure was designed to allow manufacturers of today's DVD-Video discs to produce HD-DVD discs without developing new equipment or a radically different manufacturing process. But even though Blu-Ray players, recorders, and media will likely cost more than their HD-DVD counterparts, the Blu-Ray format appears to be building more momentum than its competitor.

Blu-Ray discs benefit from a higher ceiling on disc capacity than HD-DVD, offering up to 54GB on a double-layer disc compared with a maximum 36GB on a double-layer HD-DVD disc. Blu-Ray has also wisely ditched the clunky cartridge formfactor in favor of a durable disc coating licensed by TDK. And Sony—one of the founding members of the Blu-Ray consortium—recently surprised no one by declaring that the upcoming PlayStation 3 would use the Blu-Ray standard.

Toshiba shot back by announcing it would ship a notebook PC with an internal recordable HD DVD drive by this fall. This leaves open the possibility that Blu-Ray may dominate consumer electronics, while HD-DVD captures the PC market.

Unreal 3

Epic makes it easier to make good games

When game designers and artists dream, they dream of easy-to-use content creation tools and increased polygon counts. The Unreal 3 engine should deliver both in spades.

Take the per-pixel lighting and shadowing of the Doom 3 engine, add a sprinkle of the fancy-schmancy materials processing from Valve's Source engine, and combine them with art that's so rich with polygons it will bring a GeForce 6800 SLI rig to its knees, and you have almost reached the level of detail that Epic's third-generation Unreal engine can deliver.

Of course, stunning good looks are useless to an engine if creating the art takes an inordinate amount of time. With this in mind, Epic has spent time making sure the content creation tools are top-class.

One of our favorite tricks is the engine's capacity for procedural vegetation. When you sculpt a landscape in the Unreal 3 editor, the texture that's applied to the ground changes automatically. This means that if you create a steep cliff, the texture will automatically mimic a rock wall. Create a gently sloping hill, and the texture will be green grass. Once the texture is applied, the engine will automatically fill in the trees and shrubs appropriate for that type of surface.

Given the rising costs—in both dollars and days—of high-end game design, this streamlined content creation will be a boon for developers. With Epic's consistent embrace of the game-modding community, streamlined content creation could also result in a new wave of creative 3D games, and maybe even the next big 3D experience.

What this means in terms of commercial game design is largely unknown because game design studios still have to use the Unreal 3 engine and tools to craft entertaining games. But this much we can count on: By releasing an engine that boasts quality levels up to and perhaps even beyond the Doom 3 and Source engines, Epic has ensured a healthy dose of competition—and a slew of terrific advances in graphics quality.

WINDOWS XP 64-BIT EDITION

64-bit support from Microsoft could make it an Athlon 64 year

After dragging its feet for months in 2005, Microsoft will finally release Windows XP 64-bit Edition, which will enable the 64-bit extensions in CPUs. The 64-bit Edition will support both AMD's Athlon 64/FX and Opteron, as well as Xeon and Pentium 4 CPUs that have Intel's implementation of AMD64. AMD has already stated that certain applications should see a healthy performance bump going from 32-bit to 64-bit, but that other applications will not improve. While most 32-bit code will be easy to adapt to 64-bit, Microsoft is apparently dumping all support for 16-bit code in this version of Windows.

One huge challenge Microsoft is facing is driver support. The 64-bit Edition requires driver revisions for hardware and software apps. Mainstream hardware will likely be successfully prepped for the transition, but older peripherals and add-in cards may simply break and remain broken given how long it takes many hardware vendors to issue new drivers.

What isn't clear is how well 64-bit Windows will be received, nor how it will be distributed. Early rumors indicate that Microsoft may limit the distribution to OEMs, which means you may only get it with a new machine. This could make obtaining a legal copy of the OS a challenge for those of us who already have 64-bit-ready boxes. ■

WHAT TO BUY—AND WHAT TO AVOID

Maximum PC's Lab experts present five upgrading tips that will help you master the upgrading curve

BYE-BYE, AGP MOBOS. PCI Express graphics should become the de facto standard for both Intel and AMD machines this year, so we recommend by-passing AGP motherboards.

DDR2 IS STILL IFFY. This is because of higher costs. But we still expect the spec to gain traction as higher speeds and lower-latency RAM gets introduced. Still, it's not a make or break deal yet. We recommend a cautious plunge.

SLI = A MUST-BUY. SLI has us hot and bothered. Given the performance boost, it's easy to see why. The promise of doubling your graphics performance is a no-brainer; consider SLI (and SLI mobos) a must-buy if you're a gamer. But do it now—by mid-2005, both companies will have released their next next-gen parts.

PLAN FOR DUAL-CORE. Dual-core procs won't appear until the second half of this year, but do you want to drop $150 on a motherboard that won't be compatible? Most mobo makers don't want to commit to dual-core support this early, but if you spot a board that claims it, put a big giant check-mark in its column.

SATA 2 IS A NO-BRAINER. SATA 2 is standard with the nForce4 Ultra and SLI chipset. Make sure your chipset supports this standard if you plan on buying a SATA 2 drive.

DO YOU HAVE MORE UPGRADING QUESTIONS? SEND 'EM OUR WAY AT INPUT@MAXIMUMPC.COM! WE'LL RUN THE BEST QUESTIONS—AND OUR ANSWERS—IN THE LETTERS SECTION OF THE FEBRUARY ISSUE.

HALF-LIFE 2: THE True Maximum PC STORY

Every area in *Half-Life 2* is filled with details that make the world feel "lived in." Decals on the walls and other signs of pre-occupation life are abundant.

Note how realistic the far-away buildings look. Instead of using bitmaps to draw them, Valve used actual 3D models, just as they did for nearby buildings.

Muzzle flashes and other environmental lights brighten even the darkest areas. Valve eschewed a real-time lighting engine (a la *Doom 3*) in favor of a more flexible, partially pre-computed approach.

Why Half-Life 2 is a masterpiece of game design!

The secrets that propel the game to new heights!

What the game will look like on YOUR hardware!

Tweaks to optimize the game—for speed *or* beauty!

The first 11 verdict in Maximum PC history!

BY WILL SMITH

The Source engine draws projected shadows, like many other games, but then uses a supersampling antialiasing technique to draw the edges as smooth as buttah.

The Strider shown here walks via an advanced technique known as inverse kinematics—the same technique real-world robots use to walk!

Months before its release, a top-secret source gained us access to *Half-Life 2,* ensuring we'd get a chance to play it before 99 percent of the gaming populace. Our take? It's the best game we've ever played. But with *Half-Life 2,* Valve has created not just an exquisite gaming experience; the designers have also concocted a technically sophisticated universe where every single object behaves in a realistic manner consistent with all other objects in the world.

Read on to find out how they did it.

Making Physics Phun

Once upon a time, there was an ambitious game that promised to make physics interactions an integral part of gameplay. That game, *Trespasser,* is now regularly derided as the worst game to ever grace the PC. In *Trespasser,* "physics-based gameplay" amounted to using a freakish, disembodied arm to stack improbably light boxes so you could jump over artificial barriers into new areas of the game. Its unrealistic, half-baked physics model and hybrid hardware/software 3D renderer made it unplayable and un-fun. Consequently, the title was savaged by the gaming press. Given the big ol' egg that *Trespasser* laid, it's not difficult to see why developers have eschewed physics-based gameplay in favor of simple ragdoll character animation and one-shot physics gimmicks—a la *Max Payne 2.*

That is, until *Half-Life 2.* With its latest game, Valve reintroduces physics puzzles and to our utter delight, the experiences are fun without being tedious, and feature physics-based behaviors that remain consistent throughout the game.

It's a Material World

Half-Life 2 owes its realistic physics to the tight integration of the Source engine's materials system and the third-party Havok physics engine. The materials system associates textures with certain physical properties, such as density and friction coefficient. When an artist applies a texture to a model, the model receives the attributes of the material the texture represents.

With this information, the Source engine then uses the density of the material and the volume of the object to calculate properties like mass and buoyancy. The engine then passes that info on to the Havok physics engine, which performs the grunt work of calculating forces—everything from the effects of friction on a rolling barrel to the air resistance exerted upon a grenade in mid-flight—and making sure the objects behave in a manner that is a reasonable approximation of the real world.

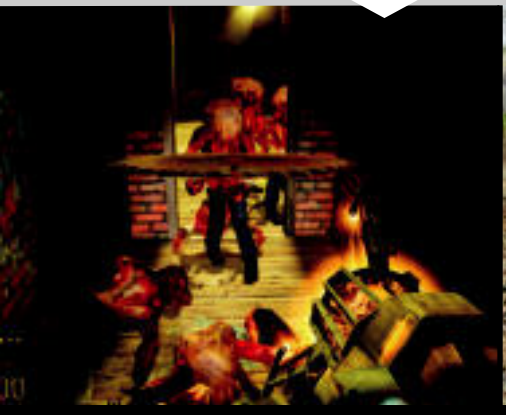
Here's the upshot: The Source engine makes it really easy for designers to add physics objects to their maps. In other games, the designers have to manually specify the weight, density, volume, and friction coefficients for *every single object in the game.* By using the materials engine, Valve was able to quickly and easily place hundreds of consistent physics objects into every level.

This refined process also means that creating physics-based puzzles is just as easy. The artists create the objects they want to use in the puzzle, and then place them into the game. The Source engine takes care of everything else, meaning there's no need to script puzzles.

PHYSICS AND YOU: REALISTIC OBJECT MOVEMENT = INFINITE POSSIBILITIES

In Half-Life 2, each level contains hundreds of physics objects that you can use in any way you desire. For example, you might pile up objects in order to climb into an otherwise inaccessible area and avoid a difficult fight, while your friend might use a piece of sheet metal as a bulletproof shield and advance under cover. Here's a more focused look at how these numerous gameplay possibilities present themselves throughout the game.

Once you obtain the Gravity Gun, it's easy to amuse yourself by coming up with new and gruesome ways to slaughter enemies. Does pulling saw blades out of walls and using them to slice zombies in half ever get old? Frankly, no.



The ability to pick up and toss hundreds of objects opens the door to some interesting gameplay choices. For example, should you use the wheelbarrow as a bulletproof shield or chuck it at your opponent? We like doing both.

Anything that is literally not bolted down to the ground can be picked up with the Gravity Gun, including tools, tables, chairs, and yes, even toilets.

And the Winner for Audio Excellence is...

Like *Doom 3, Half-Life 2* eschews hardware sound interfaces like EAX and DirectSound3D in favor of a homegrown, CPU-based audio engine. Valve's engineers found they simply couldn't deliver the high-quality aural experience they wanted using current technology. Its proprietary sound engine employs some clever tricks, detailed below, to create sound that behaves much like it does in the real world. The overall effect is extremely convincing.

Many sound effects in *Half-Life 2* are split in two—a high-frequency portion and a low-frequency portion. By playing different combinations of the high- and low-frequency sounds, the engine can approximate the way sound functions in the real world. For example, when you hear a sound under water, the game fades out the high frequencies, but leaves in the low frequencies.

Likewise, when an object comes between you and a sound source, the high-frequency sounds are reflected by the object and never make it to you. In real life, low-frequency sounds are not as easily reflected. To emulate this effect, the Source engine automatically drops out the high-frequency sound effects in these situations. If you're in close proximity to an explosion or gunshot, the engine cranks up the high- and low-frequency sounds for dramatic effect.

In addition to storing physics information for all the objects used in the game, the materials engine also stores sound effects for the various materials. Fire three shots into a piece of wood, and you'll hear three slightly different sounds. This isn't limited to bullet impacts, either. When two materials—say the metal of a barrel and the earthen ground—collide, they make one of many unique sounds.

Half-Life 2's **audio engineers recorded multiple sounds for shattering glass. Every time you plink a shot off at a window, you get a slightly different sound. You'll find yourself shooting glass and destroying crates just for the fun of it.**

Because they weren't using standard sound APIs, Valve's engineers went out of their way to support different speaker configurations. In *Half-Life 2,* the in-game sounds and dynamic music have been mixed to support two-channel, four-channel, 5.1, and headphone setups. As a result, you'll get sound that's specifically tuned to your configuration. Loads of small positional sound effects effectively immerse you in the game. For example, when something on one side of your body makes an extremely loud noise—say a grenade explosion—you lose hearing on that side for a few seconds.

Model Behavior

When you play *Half-Life 2,* you may notice that the animations for all the character models—friend and foe—look much better than those in a standard first-person shooter. Particularly impressive are visual sequences where enemies are moving in one direction while simultaneously shooting in another direction. The Source engine accomplishes this trick with a technique known as animation blending.

Let's use our favorite character, the resistence fighter shown to the right, as an example of how this technology works. This stalwart fighter has numerous animations for moving in different directions and shooting in different directions. Assume he has four running animations: forward, backward, to the right, and to the left (this is a simplification, but not a gross one). When he runs forward, the engine cues the run-forward animation, which is simple enough. But there's no animation for running diagonally! Here's where animation blending comes into play. If the soldier needs to run diagonally, the engine blends the "run sideways" and "run forwards" animations, achieving the desired effect.

This "Let's kick some ass!" scowl is the result of more than 40 bones in the character's face that have been hand-animated to convey emotion. Interestingly, the Source engine also uses a separate, unique lighting model for human faces. This gives them a healthier glow, and makes them look more realistic.

What's more, when our soldier is running diagonally, he can still shoot his weapon to the right by blending the "shoot forward" and "shoot to the right" animations with the two running animations we talked about earlier.

In terms of practical gameplay, enemies who can strafe and dodge while they lay down suppressing fire at the same time create much more challenging battles than the oft-used alternative: hordes of enemies who charge right at you with guns blazing.

HALF-LIFE 2

3D Cards and Half-Life 2: There's Something about DirectX 9

Are you saddled with an ancient Radeon 7500 board? Are you nervous that your GeForce FX 5950 won't be up to snuff? Do you want first-hand proof of why you need a top-tier 3D accelerator before you play *Half-Life 2*? It's time for 3D card answers.

Hint: You need a good DirectX 9 card to play this game!

THE WATER IS BREATHTAKING

At the highest quality setting, *Half-Life 2's* water appears stunning and realistic. At the lowest quality setting, it looks only a little better than in *Half-Life 1.* In the highest DirectX 9 mode, rendering a scene with water requires three passes. The first pass draws everything below the surface of the water. The second draws everything above the surface of the water. The third draws the surface of the water by blending the output from the first two render passes. The result is a rippling, reflective surface that looks more realistic than any other game we've seen to date.

In DirectX 9 mode with all details cranked up to the highest setting, the water not only reflects everything—including enemies and weapons fire—it also refracts objects below the surface. The deeper an object is in the water, the more it's refracted.

At first glance, DirectX 8 cards appear to render the scene almost identically to a DX9 card. But if you look closer, you'll see that the water isn't reflecting anything, and the refraction remains the same no matter the depth of the object you're looking at. The straight water line is a dead giveaway for DX8 mode.

This image just looks sad. The water is neither reflective, nor refractive. In fact, it's rendered using the same technique as it was in the original *Half-Life.* Take a look at the much lower resolution texture used for the shoreline, and the hard edge between shore and water.

THE EVOLUTION OF A HEADCRAB

The difference between 3D hardware becomes even more apparent when we take a close look at character models. On a low-end card, there's virtually no difference between *Half-Life 2* and *Half-Life,* except for slightly higher resolution textures. At the high-end, however, the difference is dramatic—the image almost looks like a photograph.

Everything in this scene—from the headcrab's scalp to the cobblestone floor—is normal-mapped (normal maps are special bump maps that encode both altitude and orientation, instead of just altitude). Note the well-defined ridges on the headcrab.

In DirectX 8 mode, the models use bump maps instead of normal maps. Source uses old-fashioned bump-mapping for the cobblestones in the street, which makes them look like they're popping out of the screen, not out of the road.

In DX7 mode, *Half-Life 2* really hurts our eyes. Look at the flat texture on the cobblestones and the models. Notice the dark blob under the headcrab? That's supposed to be a shadow. Pathetic.

HOW TO TWEAK HALF-LIFE 2 FOR SPEED AND BEAUTY

Half-Life 2 is pretty good at detecting your hardware and setting the options accordingly, but there are options you can tweak to earn an extra few frames per second or enhanced visual quality.

Unless otherwise noted, these options are located in the Advanced Video Options control panel in the game.

PERFORMANCE TWEAKS

- On maps with lots of water, adjusting the Water Detail setting can have a huge impact. Simple reflections perform well on DirectX 8-level hardware, but the "Reflect World" setting should work OK on DX9 hardware.
- If you have a slow CPU and a DX8 or DX9 card, you can pick up a few fps by setting Shadow Detail to low.
- If you have a slow CPU and lack 5.1 speakers, try switching the audio quality from high to medium. That switches the pitch shifting effects of projectiles and explosions from high- to low-quality.
- GeForce4 owners will get big performance benefits if they open the console and type `r_fastzreject 1`.

VISUAL QUALITY TWEAKS

- If you have a fast CPU and videocard—think GeForce 6800 or Radeon X800—crank the water detail all the way up to "Reflect all." Everything in the game will be reflected by every little puddle!
- The high-resolution textures and models in *Half-Life 2* demand high-quality anisotropic filtering and antialiasing. On a Radeon X800 XT card, we played at 1280x1024 with 6x AA and 8x aniso without dropping below 50fps.
- A GeForce FX card will default to DX8 mode, but it's possible to force the game to DX9 mode—just be prepared for a big performance hit. Add `–dxlevel 90` to the command line of the shortcut you use to start the game. Note that the only "DX9-capable" hardware that defaults to DX8 mode are NV30-based GeForce FX cards; NV40-based videocards, such as the GeForce 6800, perform admirably in DX9 mode.
- A couple of novelty effects are written into the game, including a black-and-white mode (console command `mat_yuv 1`). If you type `mat_hsv 1` you can run the game in value mode, which uses HSV instead of standard RGB to draw the onscreen images

And Now It's Time for the Verdict

The verdict for *Half-Life 2* is simple. It's the best damn game we've ever played. Note our use of the word *ever*. Now that we've finished it and had time for the whole experience to sink in, *we can't stop thinking about it.* Or talking about it. Whereas the original *Half-Life* put forth sheer gameplay brilliance with relatively low-budget technology, the sequel evokes the same spine-tingling play mechanics with cutting-edge technology across the board. The combination of the two results in an unprecedented gaming experience that surpasses the original in every way possible.

MAXIMUM PC KICK ASS PRODUCT

Half-Life 2 begins some time after the end of the first game, where you accepted a job working in some unknown capacity for the mysterious "G-man." Unfortunately, the portal you opened with the Anti-Mass Spectrometer in the original game never closed. And not only did aliens continue invading Earth, but a new alien menace named The Combine invaded as well. The Combine invaders have subjugated everyone and everything, and enforce their rule with an iron fist. Once again, it's up to you to don your Hazard suit and save mankind.

Believe us, you'll want to lay down some serious smack on the Combine, as they are among the finest set of enemy characters ever created.

Just walking around City 17 in the game's opening sequence, we approached an Overwatch guard who was calmly defending his post with a cattle prod. Just as we were about to walk past him, he knocked a soda can off a garbage can and told us to pick it up. Feeling smug, we picked it up and threw it at his gas-masked face. Take that, punk! A split second later, he activated his cattle prod and started chasing us.

This unprecedented level of interactivity—everything in *Half-Life 2* reacts to your actions—is a major evolutionary leap in game design. But while the dynamic interactions between you and AI characters induce goose bumps, they pale in comparison to the sheer awesomeness and limitless gameplay possibilities of the gravity gun.

You have many allies at your side; two of the most trusted are Alyx and her robotic pet.

Unlike many 3D shooters, *Half-Life 2's* game world is incredibly consistent. This means that if you think something is breakable, it usually is. Here we threw a can of white paint at a zombie. Quite post-post-modern.

As covered in our technical breakdown, *anything* can be picked up, thrown, or shoved out of the way with the gravity gun. Here's an example of what we mean. At one point, a zombie shambled towards us amid the wreckage of several cars. We walked between the cars knowing the zombie would follow, then used the gravity gun to push the cars together into a steel vice, smushing the zombie into a fine paste. This is uncharted territory for 3D shooters because gamers can now react in real-time to deadly threats in a reactive, ad hoc fashion. In all games prior, we've dealt with threats as if they were puzzles; first,

The node-based scripting allows for impromptu events. For example, when you look at this bulletin board in the game, the NPCs around you start talking about the articles on the board.

you figure out how to kill the monster, then you perform the same action again and again. Realizing the ground-breaking nature of this shift, the game's designers have created a constant progression of varying situations that will challenge your reactive skills and occasionally make you laugh out loud at how much fun the gravity gun is to use. We can't wait to see home movies of this baby in action.

Still, the game has some ever-so-minor problems. Along the way you team up with fellow resistance fighters who fight alongside you against the Combine, and they tend to follow you much too closely. If you wander into a tight hallway and have to turn around they are always right behind you, blocking your path. The Overwatch soldiers also bugged us a bit by not always reacting to the grenades we tossed. Maybe they know something we don't, but it punctured our suspension of disbelief. It's puzzling—in the original *Half-Life,* grunts would either run for cover or throw grenades back, but here they will occasionally just stand there until the grenade explodes.

In the end though, these nitpicks are just small annoyances and don't detract from the overall experience. In fact, despite these little flaws, *Half-Life 2* ranks an unprecedented, off-the-charts 11 verdict with a Kick Ass award because it's the best game we've ever played. Period. The story is gripping, the tension is palpable, the action is almost non-stop, and the presentation is superb. Not only does it innovate on many different levels, but it's also massively entertaining for the entire ride. We won't spoil anything for you, but there's a "thing" in this game that will literally be remembered as the coolest gaming moment ever.

During the development of *Half-Life 2,* Valve's internal goal was to create "the best PC game of all time." Mission accomplished. Call us fanboys, but after you experience it yourself, you'll be one too.

—**JOSH NOREM**

WOW! **11**

MAXIMUM PC VERDICT

HEADCRAB
Everything, especially the Gravity Gun.

PANTSCRAB
Allies sometimes bunch up around you.

$50, www.half-life.com

INSIDER SECRETS ABOUT HALF-LIFE 2'S DEVELOPMENT

If you want to know more about the development of *Half-Life 2,* check out the book *Half-Life 2: Raising the Bar* by David SJ Hodgson. It delves deep into the thinking behind the game's design, and shows in loving detail how Valve built this impressive sequel. Here are a few choice tidbits we borrowed from the book.

- After deciding to base the game in an Eastern European-like city, Valve decided on fall as the game's season. The developers studied weather maps of actual European cities to accurately emulate the sun's position in the sky at all times.
- The actor who performs the voice of Security Guard Barney Calhoun is also responsible for the voice of the G-man.
- The gravity gun was originally built as a tool to explore physics-based gameplay, and eventually evolved into an armament that could be used for both offense and defense.
- Towards the end of development, Valve brought in Bay Raitt, who worked on the facial animation system for Gollum in the *Lord of the Rings* trilogy. Raitt helped Valve improve the game's facial-expression and lip-sync systems.
- Pay attention to the radio commands between the Overwatch soldiers—they are real-life police call signs.

Throughout the game you meet up with other resistance fighters, and eventually lead them into battle. Though they have a tendency to follow too closely, they are great at giving you ammo when you need it.

STACK 'EM UP BLOW 'EM OUT

Not all power supplies are created equal. The Maximum PC Lab torture-tests seven power supplies to find out which ones offer the most protection, versatility, and expandability

Picture this: You've just blown your last three paychecks building a kick-ass computer replete with a 3.6GHz processor, 256MB videocard, and 400GB hard drive. You splurged on a tricked-out case and spent long hours modding it to perfection. Night after night, you tweaked and re-tweaked until you'd wrung out every last ounce of performance. But you made one critical mistake. You strapped that monster system to a $35 bargain bin power supply.

Who could blame you? After all, a beefy $200 power supply unit (PSU) nets the exact same *3DMark* score as a no-name cheapie. Why not spend that extra cash on something with a more visible return on investment, such as another gig of RAM?

Here's why: When it comes time to upgrade or overclock, or when a brownout or lightning storm finally strikes, chances are that a dirt-cheap power supply will let you down just when you need it the most, potentially taking the rest of your expensive system with it.

Here at *Maximum PC*, we've stressed the importance of a trustworthy power supply for years. Now, we conduct the hard-hitting tests that will separate the contenders from the pretenders and prove once and for all the benefits of a high-quality PSU. The results are telling; out of seven contestants, only two emerge unscathed. So who won? What constitutes a quality power supply? And how much power do you really need? Our torture tests offer some surprising answers to these pressing questions.

BY OMEED CHANDRA

BEFORE WE BEGIN...

How We Test Power Supplies: Torture Is the Name of the Game

Our challenge was to craft feasible tests that would provide useful and accurate information about how different power supplies hold up under various usage conditions. Ultimately, we settled on a series of rigorous tests that subjected the contestants to a degree of stress beyond what they would realistically be expected to endure. Our rationale: Any PSU that can cope with such an intense strain should have no problem handling the day-to-day demands of a typical power user.

First up was a load test. We built a computer packed with tons of power-hungry components—a 3.4GHz Prescott Pentium 4 CPU on an Abit IC7-MAX3 mobo, 3GB of Crucial PC3200 DDR memory, a 256MB GeForce 6800 Ultra AGP videocard, two IBM 75GXP 7,200rpm hard drives, two Seagate Cheetah 15,000rpm hard drives plugged into an Adaptec PCI SCSI card, CD-RW and DVD+RW drives, a Sound Blaster Live! PCI soundcard, a Netgear 10/100Mbps Ethernet card, and two 120mm case fans. We connected each power supply to this monstrosity and then attempted to maximize power usage by *simultaneously* performing all of the following tasks for about an hour:

- Running the *Iometer* disk benchmark (**www.iometer.org**) on both SCSI hard drives
- Scanning the primary 75GXP hard drive with *AVG Anti-Virus* (**www.grisoft.com**)
- Repeatedly copying a data DVD to the secondary 75GXP drive
- Running *CPU Burn-in* (**users.bigpond.net.au/cpuburn**) with error-checking disabled to tax the CPU
- Looping *3DMark03* (**www.futuremark.com**) Games 2 and 4 at 1600x1200 with 6x antialiasing and all visual-quality settings maxed to strain the videocard

Because power supplies operate less efficiently at high temperatures, we conducted our tests in a poorly ventilated room heated to around 100 degrees Fahrenheit to simulate a hot summer day.

We used a Seasonic PowerAngel wattmeter to measure each PSU's power factor—an indicator of efficiency—and energy consumption, and plugged the whole setup into a surge protector. Note that we measured the number of watts drawn from the electrical outlet, whereas power supplies are rated by the wattage they can provide to the computer. This is generally 60-70 percent of what is drawn from the outlet, as some energy is lost to heat, electromagnetic radiation, and other environmental effects.

For our second test, we connected each PSU to a loading device drawing about 150 watts, roughly equivalent to a typical PC under moderate load. We used a voltmeter to check each power supply's initial voltage on the 12V line—the closer our reading was to the 12V spec, the better.

Next, we simulated a severe power fluctuation. We used a voltage regulator to decrease the voltage of the electricity being sent from the outlet to the PSU from a starting point of 110V to a low of about 60V. We then measured the new output voltage on the 12V line. Ideally, this would register little or no change from the initial value. To be fair, you're unlikely to experience a 50-volt sag in real life. A brownout usually reduces voltage to between 90 and 100 volts, which all the PSUs in this roundup were able to handle. As such, the power supplies that failed at 60V aren't necessarily bad. Rather, those that survived are particularly good.

Now, on with the results.

Ultra Products X-Connect

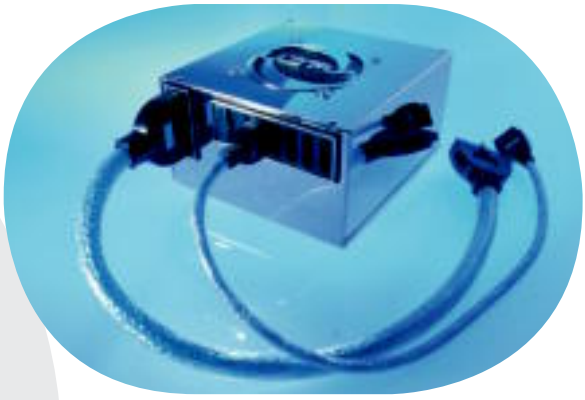
A sexy-looking power supply with an ugly disposition

The Ultra X-Connect is like a bad first date. Its sleek, intricate fan grille and shiny silver finish are immediately impressive, but after about 20 minutes, it clearly comes up short on inner beauty.

Ultra claims the X-Connect can continuously deliver 500 watts of power, but our load test proved otherwise. Everything seemed fine at first, with the X-Connect typically drawing around 350 watts from the outlet. But a few minutes into the test, we witnessed extreme artifacting in *3DMark03*—a sign of an unclean power stream. At times, a few moving white lines were all that could be seen on an otherwise-black screen. Soon thereafter, the power supply started to emit a strange and rather worrisome burning smell.

Concerned, we immediately closed *3DMark03* and shut down the computer, noticing that the Windows desktop was also badly distorted. After letting the X-Connect cool off for a few minutes, we rebooted and the graphical distortion had vanished. Fire extinguishers in hand, we tried running the load test a second time and quickly reproduced our earlier results.

In the voltage sag test, the X-Connect was a mixed bag. We measured an initial voltage of 12.57V on the 12V power rail—the biggest deviation of any PSU in this roundup, and dangerously close to the 12.6V maximum tolerance of the ATX spec. It's conceivable this could damage cheap or poorly designed hardware over time. On the other hand, when we dropped the input voltage to 60V, the X-Connect maintained an output voltage of 11.54V. That's high enough to avert a system crash.



The X-Connect ships with sturdy shielded power cables that glow under UV light, and extra cables can be disconnected to reduce case clutter. But active power factor correction—the ability to smooth out distortions in the current being drawn from your wall outlet— is absent, and the Ultra's power factor rating of 63 percent was the lowest in the roundup.

MAXIMUM PC VERDICT 4

CLASSIC ROCK

Sturdy, modular shielded cables and exceptional fit and finish.

ELECTRIC SHOCK

Poor voltage accuracy, no active power factor correction, and it failed our load test.

$100, www.ultraproducts.com

Cooler Master RS-450-ACLY

The ideal power supply for those concerned about electricity bills

Electricity bills got you down? We know how you feel. Owning a kick-ass rig doesn't just mean paying more for parts up front; it also means footing higher utility bills ad infinitum. Unless you're running Cooler Master's RS-450-ACLY 450-watt power supply, that is. While this PSU didn't lead in our torture tests, it was strikingly efficient, energy-wise.

During our load test, the other power supplies in this roundup typically consumed anywhere from 363 watts (for the OCZ) to 385 watts (for our generic reference point), with occasional spikes as high as 406 watts. Imagine our shock when the Cooler Master cruised through our load test while drawing an average of just 335 watts of power! At first, we were sure we'd done something wrong, but after double- and triple-checking our results, we simply had to conclude that the RS-450-ACLY is astoundingly energy efficient.

We do feel that Cooler Master could have done a better job of voltage accuracy, however; our measurements indicated an output voltage of 12.28V on the PSU's 12V line. For most people, this discrepancy should be no cause for concern, but it doesn't hold a candle to the mere 0.08V delta exhibited by the NeoPower and TurboCool units we reviewed. It's also conceivable that the RS-450-ACLY's unremarkable voltage accuracy could limit overclocking headroom.

The RS-450-ACLY ships with a nifty wattmeter that fits in a 3.5-inch drive bay. Active power factor correction and Serial ATA support are included, but regrettably, PCI Express support is not. Although the power cables aren't sleeved or modular, they do feature nice squeezable plugs that are easy to remove. When it comes to noise management, the RS-450-ACLY excels. With its thermally controlled 120mm intake fan, it ranked as one of the quietest power supplies we reviewed.

While it falls short of the high bar set by Antec's NeoPower and PC Power & Cooling's TurboCool, the RS-450-ACLY is a quality PSU in its own right. It lacks a few key features, but gets a boost in our rankings thanks to first-class energy efficiency.

MAXIMUM PC VERDICT 8

+ BEACH

Impressive energy efficiency, quiet, and includes a wattage meter.

– BIATCH

Voltage accuracy could be better; no modular power cables or PCI-E support.

$110, www.coolermaster.com

Vantec Stealth VAN-520A

Proof that sometimes you just can't make lemons into lemonade

Back in 2003, we reviewed Vantec's Ion, an admirably quiet 400-watt unit which was the company's first entry in the power supply market. We liked the Ion, so we had high hopes for the beefy 520-watt Stealth VAN-520A, which claims to be even quieter than the Ion while providing more power. Sadly, while the Stealth is indeed quiet, it proved incapable of delivering even a fraction of its power rating.

The VAN-520A repeatedly crashed our test system during the load test, while drawing between 365 and 378 watts from the outlet. We tried rewiring our test system for a different distribution of power, but the problem remained. We even ran *3DMark03* by itself, and the system still crashed within minutes.

Even if the Stealth was operating at 75 percent efficiency—which it wasn't—it couldn't have been supplying more than 284 watts when it crashed (378 watts drawn from the outlet multiplied by an efficiency factor of 0.75 equals roughly 284 watts of output). That's a full 236 watts below Vantec's claimed capacity, so the VAN-520A's failure is absolutely unacceptable. And though the 12.32V output voltage we measured on the Stealth's 12V rail is within the limits of the ATX spec, it's among the least accurate readings in this roundup.

In an unanticipated slice of real-world testing, we discovered that the room we conducted our load tests in has faulty electrical wiring that can't handle large power draws. Because badly designed PSUs can place more strain on the wiring in your home, this inadvertently exposed the Stealth as the most abusive participant in our roundup.

Aside from our 400-watt generic reference point, the VAN-520A was the only PSU that repeatedly tripped the circuit breaker during our trials.

Feature-wise, the Stealth comes equipped with support for PCI Express but not Serial ATA. The power cables aren't modular, but they are loosely braided for an air of professionalism. The VAN-520A was the only power supply reviewed here to offer manual fan speed adjustments, though even on its lowest setting, it was no quieter than the Antec NeoPower. To play it safe, we set the fan speed to "auto" during our tests.

All things considered, we suggest avoiding this PSU like the plague.

MAXIMUM PC VERDICT 3

+ PATRIOTISM

Quiet, and didn't blow up during testing.

– JINGOISM

Failed load test; lackluster voltage accuracy; no modular cables, SATA support, or active PFC.

$100, www.vantecusa.com

Antec NeoPower 480

This power supply is like Neo in *The Matrix*—it's truly The One

Once nothing more than an also-ran in the highly contentious power supply market, Antec has improved by leaps and bounds in recent years. The latest feather in the company's cap is the NeoPower, a 480-watt beauty that's beyond reproach.

The NeoPower certainly looks impressive. The sleek, charcoal finish exudes sophistication, and the thermally controlled 120mm intake fan provides adequate ventilation at whisper-quiet volumes. The convenient modular cable system allows unused power cables to be disconnected from the PSU so they don't clutter up your case. And while most power supplies have a single 12V power rail, the NeoPower sports two; according to Antec, this ensures a more reliable supply of power when demand is high.

Sounds good, but we were a bit skeptical about how well this scrappy comer would hold up under close scrutiny. Fortunately, the NeoPower passed our load test with flying colors, and achieved a power factor rating of 97 percent thanks to its active power factor correction. Even our tough-love voltage sag test couldn't make the NeoPower break a sweat. When we dropped the input voltage to 60V, the output voltage didn't budge from its starting point of 11.92V.

In terms of connectors, the NeoPower is about as future-proof as it gets. Aside from an abundance of standard four-pin peripheral power connectors, this PSU also includes support for Serial ATA, PCI Express, and ATX 2.0. If you're a rabid upgrader, you'll find no better PSU to put at the heart of your system. Antec even tossed in two fan-only power connectors that dynamically adjust the speed of your fans based on case temperature.

We're disappointed that Antec didn't braid or sleeve all the power cables for a more professional look, but that's a triviality. With every imaginable feature and an asking price $70 below that of the Turbo-Cool 510 Deluxe, the NeoPower 480 assumes the throne as our top-rated PSU.

MAXIMUM PC VERDICT 10

+ FIREWALL

The NeoPower has it all—outstanding quality and features, good looks, modular cables, and quietness.

– WALL OF FIRE

Braided or sleeved power cables would have been nice.

$150, www.antec-inc.com

OCZ PowerStream 520ADJ

The company famous for its high-speed memory leaps into the PSU fray

Known for making memory capable of operating at blistering speeds, OCZ Technology has thrown its hat into the power supply ring with the introduction of the PowerStream 520ADJ. Housed in an attractive, glossy charcoal box, this PSU promises 520 watts of quiet, reliable power for your components. And it delivers, for the most part.

The PowerStream had no problems in our load test, and its typical energy consumption of 363 watts was lower than much of the competition. However, OCZ neglected to equip the 520ADJ with active power factor correction, resulting in a disappointing power factor rating of just 68 percent.

Like most of the PSUs in this roundup, the PowerStream couldn't cope with the rigors of our voltage sag test, but we were more let down by its initial output voltage of 12.27V on the 12V rail. This is well below the 12.6V maximum prescribed by the ATX spec, but it's also significantly less accurate than the voltages delivered by the leaders of this pack. Overclockers may appreciate the 520ADJ's inclusion of voltage pots for manually tweaking output voltages.

With two variable-speed 80mm cooling fans, the PowerStream remained relatively quiet throughout testing. Serial ATA and PCI Express power connectors are present and accounted for, but sadly, the OCZ's power cables are not modular, and most of them are unsleeved. On the other hand, the PSU does include two dedicated power cables intended for videocards and hard drives. These cables are shielded and boast additional capacitors for an ostensibly more reliable supply of power, though it's hard to say how much difference these tiny caps really make.

All in all, the PowerStream 520ADJ isn't a bad product. But it lacks important features found in its more potent rivals in this roundup, and in the cutthroat power supply market, being an also-ran just doesn't cut it.

MAXIMUM PC VERDICT 7

+ DIRTY DANCING

Nice looks, shielded videocard/hard drive power cables, and quiet.

– DIRTY SOCKS

No active power factor correction or modular cables; voltage accuracy could be better.

$130, www.ocztechnology.com

DeVanni DP-568FL

A passable PSU for the money, but a little more dough gets you a whole lot more

DeVanni's DP-568FL is the black sheep in a showdown dominated by feature-packed power supplies with often-painful prices. This stylish 500-watt unit lacks virtually all the advanced capabilities of its brethren, but compensates with a low sticker price. The outcome is an adequate product that may appeal to penny pinchers.

Let's start with what the DP-568FL does well. For one, it emerged from our load test unscathed, with a power consumption that usually hovered around 380 watts. The polished, dark gray casing is easy on the eyes, and the abundance of fans—two 60mm intakes, one 80mm intake, and one 80mm exhaust—results in unimpeachable cooling prowess. Meanwhile, avid case modders will appreciate the PSU's integrated neon LEDs.

But despite what the DP-568FL offers for the money, it has several shortcomings. Active power factor correction is a no-show, and the large number of cooling fans keeps this PSU from winning any quietness contests. Additionally, the power cables aren't modular, and only the main power cable (that huge one that plugs into your motherboard) is sleeved. The output voltage on the DeVanni's 12V rail registered 11.77V, which is better than most of the power supplies tested here, but still nothing to write home about.

The biggest knock against this PSU, though, is its abysmal support for the technologies of tomorrow. ATX 2.0 mobos are not welcome, and don't expect to find connectors for your Serial ATA drives and PCI Express videocard either. Put simply, this means that if you were to buy the DP-568FL today, you would almost certainly have to replace it the next time you upgrade your system.

Overall, the DeVanni DP-568FL is decent. If price is paramount, it's worth considering. But keep this in mind: An additional $40 will buy you the Cooler Master RS-450-ACLY, which is a much better investment in the future.

MAXIMUM PC VERDICT 6

RINGO STARR
Attractive and cheap; passed our load test.

RICHARD STARKEY
Lacks active power factor correction and modular cables; limited useful lifespan.

$70, www.ditcorp.com

PC Power & Cooling Turbo-Cool 510 Deluxe

The erstwhile king of power supplies still rocks—but could use a little freshening

PC Power & Cooling's Turbo-Cool performance PSUs have been the foundation of every *Maximum PC* Dream Machine for the past six years, and for good reason. With almost 20 years of experience in the power supply business, these guys know how to build PSUs the right way. The Turbo-Cool 510 Deluxe continues the company's proud tradition of quality, but unfortunately, it lags the competition in a few areas.

Let's get one thing straight: You can't fault the Turbo-Cool's performance. This 510-watt behemoth breezed through our load test, and in our voltage sag test, it maintained its initial output voltage of 12.08V when we dropped the input voltage to 60V. Of all the PSUs we tested, only Antec's NeoPower matched this formidable feat. Meanwhile, the Turbo-Cool's active power factor correction resulted in a stellar power factor rating of 98 percent.

If not for Antec's NeoPower, PC Power & Cooling would have dominated this roundup handily. The Turbo-Cool does have a few advantages over its upstart competitor, such as voltage regulation to within 1 percent of spec (the NeoPower's is accurate to within 3 percent), sleeved power cables, and adjustable voltage pots for overclockers. But it lacks modular power cables and thermally monitored fan-only power connectors, both of which the NeoPower has. And whereas the NeoPower is laudably quiet, the Turbo-Cool's lone 80mm exhaust fan gets pretty damn noisy. Our test unit didn't include ATX 2.0 or PCI Express support, but for $10 more, the Turbo-Cool 510 Express will give you both, so we won't hold this against it.

The Turbo-Cool 510 Deluxe is most certainly a triumph of substance over style—if you're looking for a quality power supply, you simply can't go wrong. But Antec's 480-watt NeoPower costs $70 less, while besting the Turbo-Cool in the noise and features departments and still offering sufficient power. For the time being, at least, PC Power & Cooling is no longer top dog. But it's close.

MAXIMUM PC VERDICT 9

BEATLES
The gold standard for quality and reliability, with oodles of power on tap.

BEETLES
It's loud, expensive, and lacks modular power cables.

$220, www.pcpowerandcooling.com

CONCLUSION

The results of our tests indicate that even the biggest, baddest system money can buy doesn't necessarily need a gigantic power supply. The ridiculously power-hungry computer we used for our load test never drew more than 406 watts from the outlet. Assuming an above-average efficiency of 75 percent, none of the PSUs we tested ever had to provide more than 305 watts of power.

But it's important to remember that in order to guarantee the reliable operation of your PC, your PSU must be able to *consistently* satisfy that 305 watt demand. A quality 350-watt unit may have no trouble doing that, but a cheap, no-name 350-watt power supply will probably peak around 220W under realistic conditions. And even if it supplies your PC with enough power, a poorly designed PSU can damage your hardware over time by feeding it "dirty" power.

Ultimately, there's no harm in overestimating your power needs, but there is a lot of potential harm in underestimating them. If you can afford a big power supply, get one—remember, a bigger PSU won't consume more electricity unless the PC needs it. A 600-watter is probably a bit excessive, but there's no harm in springing for 450 or even 500 watts. At the bare minimum, we think any modern power PC should have at least a 400-watt PSU.

Regardless of how big a PSU you buy, it's in your best interest to choose a high-quality model from a reputable manufacturer. Generally speaking, we've had the best experiences with PSUs made by Antec, PC Power & Cooling, and Enermax (who unfortunately couldn't send us a review unit in time for this roundup). Of the models we tested, Antec's **NeoPower 480** and PC Power & Cooling's **Turbo-Cool 510 Deluxe** are the obvious winners. Both offer unsurpassed quality, with the NeoPower gaining the edge in features. If you're on a budget, consider the Cooler Master **RS-450-ACLY**; it performed reasonably well in our tests and is remarkably energy-efficient. ■

FANLESS POWER SUPPLY

With the Phantom, Antec hopes to reduce noise—and not skimp on quality

At press time, our Lab received the first fanless power supply we've seen from a major vendor. On the surface, Antec's 350-watt Phantom looks like a conventional PSU encased in a giant black heatsink, but unlike other PSUs, the Phantom features an advanced "full bridge" design.

Normally found in industrial-strength PSUs, full-bridge circuitry reduces the amount of power lost during the AC-to-DC conversion. In fact, Antec claims 85 percent efficiency for the Phantom, compared with around 70 percent for most PSUs. In practical terms, this translates into cooler operation and a lower electric bill.

In order to ensure that crucial components like the transformer and main capacitors won't overheat, these vital organs have been placed in thermal contact with the metal PSU chassis to improve heat dispersion. Antec says that as long as the host PC has "a good cooling system with proper airflow," there should be no problems.

We'll find out for sure next month when our Lab conducts a full review. Stay tuned!

BENCHMARKS

	Specifications and Features				Power Connectors				Load Test				Voltage Test			Price/Verdict	
	RATED OUTPUT	ATX 2.0 COMPATIBLE	MODULAR POWER CABLES	ACTIVE PFC	PERIPHERAL	FLOPPY	SATA	PCI EXPRESS	POWER DRAW (TYPICAL)	POWER DRAW (PEAK)	PFC RATING	PASS/FAIL	INITIAL 12V VOLTAGE	12V VOLTAGE @ 60V INPUT	PASS/FAIL	PRICE	VERDICT
Antec NeoPower 480*	480W	Yes	Yes	Yes	9	2	2	1	380W	388W	97%	Pass	11.92	11.92	Pass	$150	10/Kick Ass
Cooler Master RS-450-ACLY	450W	Yes	No	Yes	7	2	2	0	335W	347W	97%	Pass	12.28	SO**	Fail	$110	8
DeVanni DP-568FL	500W	No	No	No	8	2	0	0	380W	391W	69%	Pass	11.77	SO**	Fail	$70	6
OCZ PowerStream 520ADJ	520W	Yes	No	No	8	2	2	1	363W	379W	68%	Pass	12.27	9.88	Fail	$130	7
PC Power & Cooling Turbo-Cool 510 Deluxe***	510W	No	No	Yes	7	1	2	0	375W	386W	98%	Pass	12.08	12.08	Pass	$220	9/Kick Ass
Ultra X-Connect	500W	No	Yes	No	8	1	0	0	350W	367W	63%	Fail	12.57	11.54	Pass	$100	4
Vantec Stealth VAN-520A	520W	Yes	No	No	10	2	0	1	365W	378W	64%	Fail	12.32	9.61	Fail	$100	3
Generic 400-watt reference point	400W	No	No	No	6	2	0	0	385W	406W	65%	Pass	12.18	9.49	Fail	N/A	N/A

***Due to the design of the NeoPower's cables, not all of its power connectors can be used simultaneously. Numbers shown are the maximum possible for each connector type.**
****SO indicates that the power supply shut off when the input voltage was lowered to 60V.**
*****PC Power & Cooling also offers a version of the Turbo-Cool 510 which supports ATX 2.0 and PCI-E, but we did not test it.**

BROWSE THROUGH THE BEST OF 100 ISSUES!

FUN 100

This January, *Maximum PC* celebrates its 100th issue of git-yer-hands-dirty tech-mongering for hardcore PC power users and curious, sensitive newbies alike. From the inaugural issue of *boot* through the first *Maximum PC* of 2005, we take stock of when we were right, when we were wrong, and when we were just plain weird. Here's to 100 issues in the can, and another 100 awesome issues to come!

FUN 100

a class in kick-ass

Awesome PC components that rocked our world

MAXIMUM PC KICK ASS PRODUCT

VELOCD 12/10/32
TDK's VeloCD CD burner incorporated Sanyo's Burn Proof technology and made buffer underrun errors—and the coasters resulting from them—a thing of the past. (Received a 10/Kick Ass in January 2001)

3DFX VOODOO GRAPHICS
Bye-bye, bland graphics. Sayonara, sprites. 3dfx Voodoo Graphics cards transformed our PCs into monster gaming machines that no console could touch, and our lives haven't been the same since.

INTEL 440BX CHIPSET
Enshrined in our PC Hall of Fame, the 440BX taught us to expect not just speed and features, but also reliability and longevity.

IPOD
From the Land of Misfit Toys in Cupertino, California, came a gadget so great, it actually *exceeded* the hype. And subsequent versions only got better.

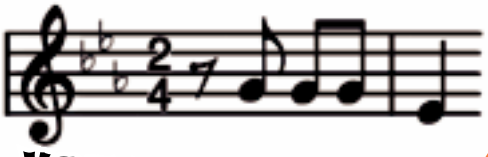
PENTIUM II
Historians may well remember the Pentium II as Intel's greatest chip, and perhaps the last time the company had a clear advantage over its competitors.

RADEON 9700
In a thrilling leapfrog over the competition, ATI's Radeon 9700 introduced support for DirectX 9 features a year before nVidia had anything similar to offer. (Received a 10/Kick Ass in October 2002)

ATHLON 64
Although the first Athlon managed to put AMD ahead of Intel in performance, it was the Athlon 64 that had Intel following AMD's standards. The latest incarnation, the FX-55, trashed the Pentium 4 Extreme Edition and offers 64-bit support to boot.

WINDOWS XP
It was a long and painful process detaching Windows from its DOS roots, but Windows XP—with its slick interface and brawny stability—was worth every minute of the wait. (Received a 10/Kick Ass in November 2001)

KLIPSCH PROMEDIA V.2-400
The 400 watt ProMedia system arrived when crappy 50W speakers ruled the land, instigating an arms race among speaker makers that has continued unabated to this day. (Received a 10/Kick Ass in January 2000)

QUAKE
3D acceleration, online multiplayer, and the first fully 3D world made *Quake* the only game that mattered in 1996.

you were warned

10 truly terrible tragedies

CORINEX POWERLINE ROUTER
"It's unbelievably slow and difficult to configure. Did we mention it's worse than wireless in every way?" (Received a humiliating 2 verdict in June 2004)

ACOUSTIC AUTHORITY A-3780
"So there you have it. These speakers performed quite well during casual testing but literally exploded during benchmarking." (Received a generous 3 verdict in March 2004)

ALTEC LANSING XA3001
"The question isn't, 'How bad does it sound?' but rather, 'Is it making any sound at all?'" (Received a devastating 1 verdict in August 2002)

OLYMPIA SOUNDBUG
"Its sound is inferior to that of a notebook PC with even mediocre speakers." (Dismissed with a 2 verdict in August 2002)

PYROPRO MP3 PLAYER
"It snaps on to the back of your PDA and makes your life a living hell." (We shot back with a 3 verdict in December 2001)

RICOH MEDIAMASTER MP9060A
"The MediaMaster produces dozens of coasters on which you can rest your favorite beverages." (Received a well-deserved 2 verdict in May 2000)

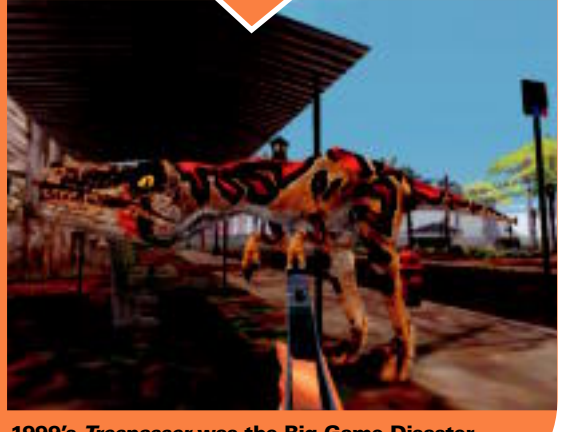
SHARP SE-500 PDA
"Tapping out even the shortest memos is guaranteed to induce carpal tunnel strain akin to that invoked by the classic board game *Operation*." (Received a take-that verdict of 2 in January 1998)

TECHWORKS ULTIMATE 3D
"Giving the Laguna more memory for textures is like giving Tammy Faye Baker more mascara. The chip may use it, but the results are hideous." (We smeared it with a 1 verdict in August 1997)

LEK FUTURENOTE MX200
"Imagine waking up on Christmas morning expecting a brand-new BMX bike, only to find a hamster that suffocated and died before you had a chance to tear open the gift-wrap. Sound harsh? It should—the MX200 certainly is." (We unwrapped a 2 verdict in June 1997)

SCSIVision
"While the disc sorely lacks value and quality components, it *did* have all of us on the floor laughing at its badness." (Received a 2 verdict in January 1997)

TRESPASSER
"*Trespasser's* few accomplishments are buried under a mountain of technical glitches, visual grossness... sometimes extinction is the best thing." (Received a biting 3 verdict in January 1999)



1999's *Trespasser* was the Big Game Disaster before anyone had ever heard of *Daikatana*.

we take that back

The biggest regrets from the Lab

GO-L COMPUTERS (JANUARY 2004)
"Too good to be true?" That's what we asked about the advertised specs of Go-L Computers' PCs and laptops. We got our answer in November 2004 when the company folded before we managed to find a single credible testimonial from anyone who actually succeeded in buying a Go-L machine.

HALF-LIFE 2—Game of the Year! (AUGUST, 2003)

MATROX PARHELIA (JULY 2002)
Triple-monitor "surround" gaming... It all seemed so sweet. For a second.

MULTILEVEL CD TECHNOLOGY (SEPTEMBER 2001)
We said that MultiLevel technology—which increases the capacity of optical discs by burning "pits" in one of eight shades of gray—was "ingenious." And we kept saying it for years until we tired of waiting for a shipping drive.

KENWOOD 72X CD BURNER
We tested the "bejeezus" out of ours and were delighted with the results. But hordes of recipients of defective units were less impressed. (Received a 9 in May 2000)

THE MILLENNIUM SURVIVAL KIT—Answer to Y2K's most pressing questions! (JANUARY 2000, naturally)

"CHROME TECHNOLOGY promises media-rich online CONTENT." (JUNE 1998)
The editors regret this momentary lapse into marketing crap-speak. It won't happen again.

ANY COVERAGE whatsoever of PC graphics "hardware" from a group called BitBoys.

IBM 75GXP
IBM's 75GXP hard drive reigned as a top choice for power users until drives began to fail—and then the drives that replaced the failed drives failed as well. Aye! (Received a 9 in January 2000)

RAZER BOOMSLANG
We gave a thumb's up to the Razer Boomslang, an execrable mouse that assured you wouldn't last more than 15 seconds in any deathmatch. Man, we gotta lay off the thermal paste for a while. (Received an 8 in March 2000)

FUN 100

readers respond! @

10 fabulous letters from our gentle audience

MISTAKES WERE MADE
"Any magazine stupid enough to pour two gallons of gasoline on a dozen Duraflame logs, expecting to put out the resulting conflagration with a 20 pound fire extinguisher has my vote!"
Larry Burwell, January 1997

WE HOPE HE LIVES ALONE
"In this unholy and wretched world we call 'society,' the only real sense of peace is when I sit at my blessed computer and start slashing away." Jethro Bodean, March 1997

ANGRY QUAKER
"DirectX sucks! Mr. Gates should take heed. After all, it's one thing to piss off users, but it's quite another to piss off *Quakers*!"
Matt Livingstone, May 1997

THANKS, TOOTS!
"Comparing computer speeds and feeds to women's physical appearances is insulting and derogatory. It is also a bit sick to think that your readers find computers sensuous and 'incredibly desirable.'"
Lisa Howe, June 1998

ANOTHER ANGRY QUAKER
"I pray that you will reconstruct your magazine into one that does not go against the principles in the Holy Bible."
Jethro, January 1999

INDEED, THEY WOULDN'T
"I don't find any humor in your article regarding the [alternate] uses of a G4 Cube. You will never find a Mac person taking a PC apart to show uses other than what it was intended for."
Lani, December 2000

LIKE GIGLI?
"Several times, I have caught my dad visiting certain Internet sites and downloading certain movies that he shouldn't. Both my mom and I are very worried about him, his marriage, and our family. I was wondering, what is the best filtering software out there?"
Name withheld, October 2000

NO REFUNDS
"Your magazine is a fetter/to this great life of mine/and the only thing better/at wasting my time/is writing this letter/for a lousy 7.99!/Return my hard-earned cash/from your ill-gotten stash!"
Anonymous, August 2001

BLATANTLY AND UNDENIABLY GEEKY
"[In a previous issue], Gordon Ung tells a reader that in "Star Trek OG' the command staff wears gold, and concludes that 'in the first six movies, everyone just wears red.' That is blatantly and undeniably wrong, wrong, wrong, wrong! In the very first StarTrek movie, *StarTrek: The Motion Picture*, everyone wore rather form-fitting white and gray." Tao Tan, April 2001

BUT ARE WE "SENSUOUS" AND "INCREDIBLY DESIRABLE"?
"I don't savor each issue of *Maximum PC* like the last bite of dessert for its mere ingredients. It's the flavor—the style—the incredible wit and charm you guys mix into every issue that brings a tear to my eye as I read the final words of 'Rig of the Month' and realize my ice cream is all finished!"
Mojo, April 2003

FUN 100

great moments in the lab

After 100 issues, there's bound to be some treasured memories

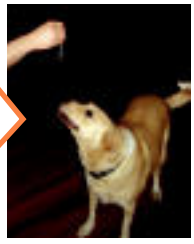
games geeks play

Multiplayer mayhem in the Lab

- BATTLEFIELD 1942
- SPLINTER CELL: PANDORA TOMORROW
- STAR TREK: BRIDGE COMMANDER
- QUAKE, QUAKE II (WITH LITHIUM PATCH), QUAKE III
- COUNTER-STRIKE
- DESERT COMBAT
- TRIBES
- SHOGO: MOBILE ARMOR DIVISION
- UNREAL TOURNAMENT
- TEAM FORTRESS CLASSIC

THE LAB'S BEST FRIEND

Many a concerned reader wrote in to make sure that we didn't, in fact, feed a USB key to Lucy in our flash memory challenge. We didn't.



HOT FOR TEACHER

Accused by a reader of "fuzzy math" in our percentage calculations of GeForce3 benchmarks, we turned to a higher authority: Mrs. Schartung, Will Smith's 10th grade chemistry teacher.

TURNED UP TO "11"

After our first set of Acoustic Authority A-3780 speakers blew up during testing, we trained the camera on the replacement—you know, just in case. Sure enough: Kablooey!

THE BROWN NOISE GENERATOR EXPERIMENT

In an effort to duplicate the infamous "brown noise," we created a 2.12 speaker arrangement and cranked up the bass. The 12-subwoofer combo rattled our bones, but thankfully left our bowels intact.

LOOK WHAT WE FOUND!

The agony of moving our entire Lab upstairs to a larger and better equipped facility was mitigated by a surprising find: former Reviews Editor Josh Norem!

"I ACTUALLY THINK THAT WAS WILL'S FAULT." —Gordon Mah Ung

With a sheet of Plexiglas and a smoke machine, we were able to determine that having more intake fans than exhaust fans doesn't improve airflow. We were also able to determine that the building's fire alarm was in fine working condition.

GESTATION POD

Instead of waiting for the perfect intern to arrive, we made our own. And the Lil'est Intern quickly proved that size really doesn't matter.

THE MELTING SAFE DISASTER

Our tests revealed that a so-called "fireproof" safe from one manufacturer wasn't so fireproof. And neither was the parking lot we set ablaze. Our bad.

THE WHITEBOARD

When all else fails, the whiteboard comes to the rescue with an almost occult reliability to solve problems in the Lab.

FOAMY THINGS

Why not use insulator foam to silence your PC? The reason, we learned, is that foam expands a lot more than you'd think. A *lot* more.

The test PC was taken out the back door and quietly retired in the dumpster.

monster-size technology revolutions

LINUX

Not just a great OS in and of itself, but a sharp stick in the side of Microsoft. How much "innovation" would there be in Windows without an open-source alternative breathing down the company's neck?

MP3

AAC, WMA, OGG, iTunes... they all owe a mighty tip of the hat to the audio compression format that started it all.

CHEAP FLASH MEMORY

More economical in size and power requirements than miniature hard drives, flash memory takes over where the floppy disc left off.

3D ACCELERATORS

Essential to gamers. Essential to *life*.

LITHIUM-ION BATTERIES

Longer lasting than nickel-cadmium rechargeables—but without the "memory effect"—lithium-ion batteries power just about every laptop, PDA, and MP3 player we use today.

BROADBAND

There's something to be said for the old days of tight, no-frills HTML coded for 14.4bps modems... No, wait, *screw that*. We love our gluttonous DSL and cable connections, and when fiber optic comes to town, we'll be the first in line to get it.

WIRELESS NETWORKING

Liberated from CAT-5 cable and Ethernet ports, our PCs and handhelds are free to roam—just as nature intended.

PEER-TO-PEER NETWORKING

P2P networks created an affordable distribution infrastructure that broke the entertainment industry's stranglehold on content delivery. Free music! Free movies! woo hoo!

DIRECTX

It took a few iterations to perfect, but DirectX has emerged as the savior of PC gaming.

WINDOWS NT KERNEL

The Windows NT kernel brought together power and stability before Apple Computers could even spell "multithreading."

FUN 100

got a bone to pick?

The Watchdog's on the case

CAUGHT AT HOME

Sometimes, executives can be very hard to reach. Especially if their companies are under investigation. But once the Watchdog catches a scent, it's hard to get him off the trail. Here, Info Peripheral's president Paul Lee is grilled in an ambush phone call (the number was provided by a disgruntled former employee).

Dog: "Can you tell me if Info Peripherals or Info Connections is still in business?"
Lee: "I have nothing to tell you right now."
Dog: "Will the reader be able to get his scanner back?"
Lee: "I'm sorry, I can't tell you anything. Thank you."
Dog: "Is there anyone else I can talk to?"
Lee: "Thank you. I'm sorry."
(February 1999)

STARGATE 2000

The Dog suspected something fishy may have been going on with Stargate 2000. Sure enough, one month after the Dog spoke with the company about a complaint, the FBI arrested the owner on suspicion of extortion, mail fraud, and making false statements. (April 1999)

FAST AND FURIOUS

Kenwood's 40x40 Zen drive was fast in performance and also in litigation. *Maximum PC* readers formed a posse and successfully sued the company over the unreliable drives. The result was full exchanges for newer models. (September 1999)

THOSE ARE PEOPLE WHO DIED, DIED...

Cue up the Jim Carroll song and sing along: Avatar, Syquest, Info Peripherals, Storm Technology, JTS, S3, Hercules, Aureal, Aims Lab, Hi-Val, Smart and Friendly, Super Power, WebGear, Razer, Onstream, Ricochet, Altima 2000, Max Gate, Step Thermodynamics, Elsa, Crossline, Microworkz, Kiwi, CyberMax, AMS, Maximum PC (no relation), Quantex, Patriot PC, Axis Terra, Axis Systems, Viking Computers, Minds@work, X-Dream Machines, KDS Computers, Cendyne, Overclockershideout.com

GETTING PORN SAFELY

"Dear Dog: I have an embarrassing problem but don't know who else to turn to."

It wasn't genital burning; it was getting a refund from a porn site. The Dog contacted the porn site and found the business quite professional and easy to deal with. On top of that, the Dog offered some tips on getting porn safely, so as to prevent embarrassing incidents like this one: "Some friends and I came back to my home pretty wasted and decided that the best thing to do was look at some porno." (June 2000)

OOPS

What's a bit or two? Hewlett-Packard offered customers of its Jornada Pocket PC a full refund after discovering that its engineers goofed by putting the wrong graphics chip in the units. Instead of being able to display 65,536 colors as HP advertised, the units could display only 4,096. (Sept 2000)

WE PRINTED THAT?

Richard Doane had problems contacting WebGear for support on its Aviator product. There was no help to be found from the defunct company, so the Dog vented his spleen by: "giving the company a minus-9 verdict and a Suck Ass award for its inability to be straight with its customers." (April 2001)

IBM DEATHSTAR

Proving that some lawyers do wear white hats, Philadelphia attorney Jonathan Shub sued IBM on behalf of *Maximum PC* reader Michael T. Granito over the company's unreliable 75GXP Deskstar hard drives. It wasn't just Granito of course; hundreds if not thousands of consumers were affected by the drive's reliability issues. The class-action suit is still pending but it's clear that IBM blew it on this drive. (May 2001)

BROTHER, CAN YOU SPARE A RECALL?

A lot of eyebrows were raised when the Watchdog ran a recall notice for Brother printers just opposite a full page ad for Brother printers. (January 2003)

EVACUATE, IN OUR MOMENT OF TRIUMPH?

There were many follow-ups to the IBM Deskstar issue, but the Dog's publishing of internal documents was our favorite. "We have woven a story based upon half-truths and misinformation that now places IBM in a position that is almost untenable.... If Compaq finds out that we have misinformed them, who is going to stand up next to the account team and explain how this happened?" (February 2004)

the doctor's top ten prescriptions

An ounce of prevention is worth a pound of swear words

bold, big-mouthed, and sassy as hell

The editors pick 10 of our favorite feature stories

DO IT YOURSELF (APRIL 2004)

HARD DRIVE HANDBOOK (OCTOBER 2003)

NEXT-GEN GAME ENGINES (OCTOBER 2002)

THE LAST DAYS OF 3DFX (JUNE 2002)

BEYOND THE X-RATING (SEPTEMBER 2001)

CLEAN START (JUNE 2000)

BUILD IT (SEPTEMBER 1999)

LINUX MANIFESTO (JULY 1998)

THE CARMACK INTERVIEW (DECEMBER 1997)

DREAM MACHINE (SEPTEMBER 1997)

UPDATE YOUR CHIPSET DRIVERS

Chipset manufacturers update these all the time to solve incompatibilities and crash problems. Get them from your mobo manufacturer now!

DEFRAGMENT YOUR DRIVE

Defragging your drive regularly can give your older machine a surprisingly hefty performance boost.

USE A FIREWALL

Firewall software will protect your machine from many of the nastiest self-spreading viruses and worms on the Internet.

DON'T BE CAUGHT WITHOUT ANTIVIRUS SOFTWARE

No one who uses their machine on the net should ever be without antivirus software. Like, *duh*.

GET RID OF SPYWARE

Sometimes the only way to get rid of spyware is to uninstall and reinstall Windows. But before you go to those lengths, download *Spybot: Search and Destroy* and *Ad-Aware* and do full system scans.

BURN AUDIO DISCS SLOWER

Some audio CD players have problems playing audio discs burned at high speed. We recommend using speeds no higher than 16x for Redbook audio.

DON'T USE AN ANEMIC POWER SUPPLY

A PSU that doesn't provide enough juice can make your machine unstable and wonky. 350W is the minimum we'd use for even a non-gaming rig these days.

BACK UP YOUR DATA

Without regular backups, you live at the mercy of your hard drives. Back up your important data at least once a week.

FIX YOUR 802.11 WOES WITH SERVICE PACK 2

Service Pack 1 borked Windows built-in Wi-Fi config utility. SP2 fixes it. If you have trouble staying connected to your Wi-Fi network, you know what to do.

INCREASE THE REFRESH RATE OF YOUR MONITOR

Get headaches after using your computer? Up the refresh rate to at least 75Hz.

don't say we never give you anything

One of 10 100GB portable drives from Seagate!

So your USB key can hold a gig of data—big whoop. These svelte, pocket-size puppies hold 100 times more than that (100 issues: 100GB—get it?!), and one can be yours by simply e-mailing us at iwantone@maximumpc.com by February 28, 2005!

No purchase is necessary to win. Entries must be received no later than February 28, 2005. The winner will be chosen on or about March 4, 2005, and will be notified by e-mail (or regular mail). The odds of winning depend upon the number of entries received. Future Network USA, Inc. ("Future USA") cannot be responsible for lost, late, misdirected, or incomplete entries. The prize is nontransferable and no substitutions will be allowed. Winners will be determined by a single random drawing of all valid entries and the decision of Future USA shall be final. You may obtain the name of the winner by sending a stamped, self-addressed envelope to the address above. This contest is open to residents of the United States only. Return of any prize or prize notification as undeliverable will result in disqualification and an alternate winner will be selected. The winner may be required to sign an affidavit of eligibility/release of liability/prize acceptance within seven days of receipt; failure to do so upon request will result in forfeiture of the prize. By acceptance of the prize, the winner agrees to the use of their name and/or likeness for purposes of advertising, trade, or promotion without further compensation, unless prohibited by law. Future USA is not responsible for any damages or expenses that winners might incur as a result of this contest or the receipt of any prize. Winners are responsible for paying any income taxes on the value of the prize received. Void in Rhode Island, Puerto Rico and where prohibited by law.

Ask the Doctor

Symptom ▶ Diagnosis ▶ Cure

ENSIGN—STATUS!

I have a problem similar to the disappearing status bar in *Internet Explorer*; in my case, it's Windows Explorer that keeps losing its status bar. Is there a Registry hack to correct this?

Also, is there a way to change the default folder tree in Explorer? Every time I open it, it defaults to the "Documents and Settings" folder. Can I change the default so the folder of my choice opens?

—BRYAN BOUNOUS

For readers who missed the Doctor's response to an earlier letter about Internet Explorer's bad habit of losing its status bar, Microsoft's clumsy work-around can be found at the company's support site. Go to support.microsoft.com, enter "330216" in the search field, and you'll get the Knowledge Base article "Status Bar Is Not Displayed When You Open a New Browser Window."

The Doctor has found that a similar technique restores the status bar in Windows Explorer. Under the View menu, select Status Bar (it should be checked from now on). Then go to Tools > Folder Options, select the View tab, and click Apply to All Folders.

Windows XP Service Pack 2 includes a fix for the disappearing status bar in *Internet Explorer*, but the Doctor has heard anecdotal reports of the problem persisting in Windows Explorer, although he hasn't experienced the problem himself since installing SP2.

You'll be glad to hear you can change the folder that Windows Explorer goes to by default. Right-click the Windows Explorer icon (Start > All Programs > Accessories > Windows Explorer) and select Properties. In the Target box, you'll see explorer.exe. All you have to do is add a single space after explorer.exe, followed by the name of the folder you want Explorer to navigate to by default. For example, if you want Explorer to start up in a folder called c:\brainfu, the Target box should read %SystemRoot%\explorer.exe c:\brainfu.

That's two questions, so you owe the Doctor two co-pays.

DID I BURN OUT MY BIOS?

I decided to upgrade my BIOS to see if it would solve an XP problem. The BIOS flash utility appeared to erase and reprogram the BIOS. When my computer restarted, the screen went blank, the system froze, and the keyboard inputs wouldn't work. After waiting about five minutes, I powered off the system. When I turned the system back on, there was no display and no response from the keyboard. What can I do to get my computer working again?

—DAVID MAURICE

It sounds like you killed your BIOS. You didn't specify what motherboard you have, but hopefully it's a board that has some kind of backup. Many new motherboards are able to recover from a corrupt BIOS by booting to a floppy or CD and throwing a recovery jumper. Asus, for example, calls it Crash Free 2, and many other motherboard vendors have adopted similar technology. Others, such as Gigabyte, even feature dual-bios chips on the board. If one chip gets flashed improperly, you can fire up the backup BIOS to bring the board back.

If you fry your BIOS with a bad flash, you may need to physically replace the chip.

In your case, you should first pull the power to the PC, hit the "on" button to discharge the power in the power supply, and than reset the CMOS. If you can't find the jumper to do this, just remove the coin-cell battery for five minutes. Replace it, plug the system back in, and try booting the PC. If it doesn't boot (remember to plug your monitor back in and to power it up), the BIOS is probably dead.

Look at the motherboard manual or on your mobo maker's web site to see if a recovery option is available. If not, you may have to replace the BIOS chip on the board. Contact your motherboard vendor to see if you can buy a new chip (many boards today use a socketed design). If not, several online stores sell replacement BIOSes.

PLAYING WITH FAIRPLAY

I recently performed a clean install on my PC, but before doing so, I backed up my purchased *iTunes* music. Am I going to have issues with Apple's FairPlay digital rights management when I try to reinstall my music this weekend, or has Apple put me in the spot of bootlegging music I bought from them from another PC? If the music industry wants me to stop getting music for free, fine. But I had best be able to play what I've paid for, otherwise I'm going back to my old habits.

—DONALD BENSEN

While "digital rights management" as we know it today offers the consumer far less compared with traditional media like compact discs, Apple deserves credit for developing the least punitive and messy system for online music purchases. When you reinstall *iTunes* and play a protected track, *iTunes* will automatically prompt you to "authorize" what it sees as a "new" PC (up to five PCs can be authorized to play your purchased tracks). From then on, *iTunes* will automatically transfer licenses of protected tracks to this PC as you play them. All the authorizations and licenses are kept on Apple's servers so if, for example, your PC's hard drive buys the farm, you won't lose your purchased music.

There's a small catch. Before performing your clean install, you should have instructed *iTunes* to "deauthorize" that PC first (under Advanced > Deauthorize Computer). But you can still revoke the license of a PC you no longer have access to by going to www.apple.com/support/itunes/authorization.html and using the web form at the bottom of the page. Don't forget to select "Computer Deauthorization" from the "Specific Request" drop-down list.

And by the way, if the "old habits" you refer to include copyright infringement, the Doctor advises you to not advertise your intentions while using your real name in a nationally distributed magazine. Salud!

STRANGE SOUNDS FROM MY COMPUTER COME

I recently upgraded my system to include an Abit mobo and P4 processor. I am using the onboard AC-97 sound chip. My problem is that when the hard drive is accessed or the mouse is moved or I am displaying a "busy" web page, I hear a thumping sound coming from my subwoofer. I have downloaded and installed the latest drivers but I still have the problem. My speaker system is Logitech's Z-640, and I did not have this problem with the onboard sound on my previous mobo. None of the manufactures have offered any solutions.

—WILBERT P. FLESCH

You're probably running into one of the main problems with mother-

board-based audio: noise. With tons of traces for the expansion slots, RAM, SATA, PATA, etc., a motherboard can generate an incredible amount of electrical noise. Motherboard designers try to minimize the noise factor by situating audio circuits away from especially noisy circuits like power, but such design measures are ultimately bound by a motherboard's production costs.

Your board may simply have a circuit that's too close to the audio, which would create noise under certain circumstances. Not all is lost, though. You may want to first try playing with your mixer levels and speaker levels to see if you can minimize the sound. Sometimes, increasing the speaker's volume while decreasing the volume from the motherboard can help reduce the noise problem. This is a longshot, but you may also want to make sure the speaker isn't picking up interference from the system because its power cables are wrapped around the LAN cables.

If that doesn't work, it may well be time to buy an Audigy 2 soundcard.

AUDIGY ACTING UP

Following a recent LAN party, my computer refused to boot. After some thorough testing, I found that the naughty piece of hardware was my Audigy soundcard. It caused the system to randomly lock up, and refused to accept drivers. I hate my non-EAX onboard sound. Is there any hope, or has my card seen its final days?

—RUBEN MARTINEZ

Creative's soundcards are known to have issues when interacting with mobos equipped with VIA's 686 southbridge, but assuming you don't have such a motherboard, there are a couple things you can try to solve your problem.

The Doc recommends that you first try the Audigy card in a completely different system to see if it's still functional. If it misbehaves in that box, send it to the spice mines of Kessel. If you find that the card works in the alternate box, then it's time to examine your system. Try plugging the card into another PCI slot, getting the latest BIOS and chipset drivers for your motherboard, and possibly moving your other PCI devices around to see if that solves a conflict. Furthermore, onboard devices on new motherboards work by bridging through the PCI bus. Try disabling a few onboard devices to see if the problem clears up. Of course, running this all on a clean install of Windows XP may also help solve the problem. If none of this works, then you've got a nice new door stop.

FIX MY WONKY WI-FI

When I'm on my home wireless LAN, the signal between my router and laptop will drop out every 15 minutes or so. The signal strength is excellent or very good the rest of the time. It just dies without warning. The laptop will find the router again in about 30 seconds, and I will see a message from Windows XP asking me to select my network.

I'm using Windows to configure the connection and have all other third-party networking utilities disabled. I'm at a loss for why this happens.

—JEFF LOPER

Most likely, the problem has nothing to do with an error or misconfiguration on your part, but rather with a bug in Windows XP's Wi-Fi configuration applet, which surfaces when Windows detects more than one available Wi-Fi network. The fix is simple, download Service Pack 2 from www.windowsupdate.com and install it. We haven't had a single dropped Wi-Fi connection since we installed the update.

ADVANCED EXACT AUDIO COPY TRICKS

I recently started using *Exact Audio Copy* to convert my CD collection to MP3. I love its effortless operation! Just one question: When I rip, say, a soundtrack with multiple artists, the program creates multiple folders for the album. As you can imagine, this creates a *lot* of folders for albums that feature multiple artists. Is there a way to force the program to create a single folder for the album, like when I rip a single-artist CD?

—CHRIS CUPLER

This same problem haunted a couple of ***Maximum PC*** editors, and we're happy to report it's relatively easy to fix. You just need to tell ***EAC*** to use a slightly different naming scheme for compilation CDs than it uses for single artist CDs.

Open ***EAC***, go to the EAC Options panel, click the Filename tab, and check the "Use various artist naming scheme." ***EAC*** uses different variables for track artist and CD artist. If you want to create an artist/album/track number–track title naming scheme, you can use %A/%C/%N–%T for the normal, single-artist naming scheme, and %D/%C/%N–%T for the various artist naming scheme. ■

HOME SPEAKER REPAIR DOs AND DON'Ts

I have a Logitech Z-680 sub that's developed a rattle inside of the box. I believe something inside has come loose. When I play my system loud it tends to rattle from inside. I know it's not the actual driver rattling. I've checked it closely, and I want to resecure whatever is rattling inside of the cabinet.

—MARCO LEBRON

The Doctor has experienced the infuriating "subwoofer rattling" phenomenon as well, so we feel your pain, Marco. Unfortunately, it's just not a good idea to attempt to dismantle the subwoofer. Not only will it void your warranty, it could also permanently damage the device.

If you examine the Z-680 subwoofer, you'll notice there are no exposed screws or signs that say "open here." This is done for a reason. All subwoofers are explicitly designed to be completely air tight and are sealed shut at the factory to ensure that when the driver moves, air moves only one way—out of the subwoofer's port. The precise flow of air out this channel helps bass sound nice and tight. If you remove the driver you will break the unit's air seals, and there's a strong likelihood you will cause permanent damage to the subwoofer.

The Doc advises you to send the unit back to Logitech for repair or replacement. You can call Logitech's customer support at 702.269.3457.

Instead of trying to open a busted sub, just send it back to the company for a replacement.

Don't let the winter weather get you down. Even in the coldest conditions, you have your PC—as long as it's healthy, that is. If your PC isn't totally in the pink, it's time to e-mail the Doctor (**doctor@maximumpc.com**), for his special brand of PC medicine any less potent.

How To....

A step-by-step guide to tweaking your PC experience

BUILD A BARTPE DISC

It's all you'll need to rescue and repair a recalcitrant computer!

MAXIMUM PC
TIME TO COMPLETION
00:30
HOURS MINUTES

BY GORDON MAH UNG

Everyone has been hit by the one-two punch of viruses and spyware. If you run Windows and are connected to the Internet, it's difficult to avoid these problems. Even worse, the latest viruses and spyware programs are designed to be almost impossible to remove. Often, your only option is a complete reformat. Still, there are methods to expunge evil programs from your PC.

One way you can prepare yourself for catastrophe is to create a Bart's Preinstall Environment disc. Named for its creator, Bart Lagerweij, a BartPE disc lets you boot into a familiar GUI from a specially prepared CD-ROM. This means that even if your installation of Windows is hosed, you can gain access to your hard drive and back up valuable documents and files and/or access the Internet.

Booting off a CD is also a great way to scour your hard drive for the most annoying viruses or pesky spyware applets that run on Windows startup and therefore block all attempts at removal. But the very best thing about a *BartPE* disc is its price: free.

Get your tools together

For this project, you'll need a copy of *PE Builder*, which is available for free at **www.nu2.nu** or on the disc that came with this magazine (the latest version is 3.0.32). You'll also need a copy of Windows XP Home or Pro with Service Pack 1 or 2 slipstreamed into it. If you don't have a slipstreamed version of XP, check out our October How-To (also on the disc, and available online at **www.maximumpc.com/howto**). Although the compiled BartPE disc will work on Windows 2000 systems, it *must* be created by a machine running Windows XP or Windows 2003 Server.

You'll also need Internet access to download the dozens of plugins you can add to your BartPE disc—everything from telnet to FTP clients to stripped-down web browsers to free CD burning software to spyware and virus removal apps.

Finally, you'll also need a CD-R/RW drive and software that can burn an ISO disc image (we used *Nero* for this project). We recommend that you burn your first BartPE disc as a CD-RW because it may take a couple of tweaks to get it just right.

A BartPE disc will let you troubleshoot a busted copy of Windows better than the tools that Microsoft provides.

***PE Builder* will check your OS disc to make sure you have XP with SP1 or SP2 slipstreamed.**

This is Gold Leader. We're starting our attack run

After you've downloaded *PE Builder*, extract it into its own directory. Once extracted, open the directory and execute pebuilder.exe. Insert your Windows XP disc into an optical drive and point the *PE Builder* to it. Hit the "Check" button and *PE Builder* will verify that you have the correct OS version. *PE Builder* works with Windows XP Home and Pro, but only with SP1 or SP2 slipstreamed in. It also works with Windows Server 2003 Web, Standard, and Enterprise editions.

Make a basic disc

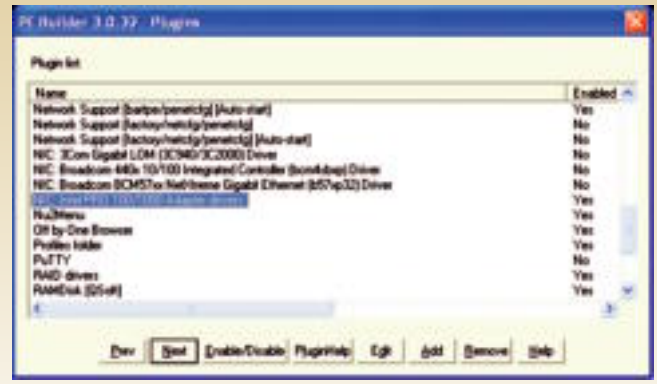
If you don't have the attention span to add drivers or plugins, click "Next" and simply compile your BartPE disc now. Once burned, this CD lets you immediately boot into a BartPE environment and browse the machine using A43—a Windows Explorer equivalent. You can also run a rudimentary Check Disk and gain basic network access. Skip ahead to the step labeled "Burn your Bart PE disc" to finalize your disc. But if you want to add drivers for your RAID or network cards, read on.

Add drivers

The thing that makes a BartPE disc interesting is the ability to customize your disc with drivers for the hardware in your system. For example, some preinstall environments require you to insert a floppy disk with RAID or SATA card drivers every time you boot off the disc. That's a drag! Without drivers and crucial applications, your disc is useless.

PE Builder supports lots of hardware and dozens of free applications, but these apps and drivers are not included with the *PE Builder* app. To install them you must download the files yourself. Fortunately, the program holds your hand through most of the process. If you didn't skip ahead, *PE Builder* should be displaying a screen that says "Plugins" on the top.

Adding drivers is as easy as clicking the appropriate plugin and following the install procedures. Usually this entails downloading the correct drivers, decompressing them to the appropriate directory, and enabling the plugin, although you may need to manually edit some text files if required by the plugin. Regardless, *PE Builder* will provide step-by-step instructions for each supported plugin. If your hardware isn't listed as supported by *PE Builder*, you may be able to find it by searching the Internet.



To enable a plugin, highlight the feature, click enable, and follow the directions that *PE Builder* gives you.

Once you've installed drivers for your RAID or SATA controllers and network controllers, it's time to install applications.

Stinger
File About
Scan Now
Stop
Preferences
List Viruses
Scanning:
Directory: C:\Documents and Settings\jnoren\Application
File: C1704108d01
McAfee AVERT Stinger Version 2.4.4.0 built on Nov 8 2004
Copyright (C) 2004 Networks Associates Technology, Inc. All Rights Reserved.
Virus data file v1000 created on Nov 8 2004
Ready to scan for 45 viruses, trojans and variants.
Scan initiated on Tue Nov 16 14:39:40 2004
Scanning...

Add applications

The most important applications to include on your BartPE disc are virus and spyware removal programs. Without them, your BartPE disc will be little more than a nifty toy.

McAfee offers two free virus scanners that should take care of all your antivirus needs. *Stinger* is a stand-alone app checks for any bad worms floating around on your PC. *SuperDat* is a command-line app with a GUI that scans for a comprehensive list of viruses. Both are easy to install using the instructions built into *PE Builder* and they'll take up very little space on your BartPE disc.

For combating spyware, we recommend *Ad-Aware*. When this magazine went to press, a plugin for the program was unavailable, so you'll need to follow the instructions in the next step for manual installation.

As with the drivers, you'll have to install applications yourself. If there is a supported plugin the process is exceedingly simple—hitting the PluginHelp button will give you links and directions.

Adding Ad-Aware

Before you bolt *Ad-Aware* onto your BartPE disc, you need to first download and install it to your computer. You can get *Ad-Aware* from **www.lavasoftusa.com/software/adaware**.

From within Windows, navigate to the Programs\Lavasoft\ directory and copy adaware.cmd, ad-aware.exe, alert.wav, defs.ref, default.awl as well as the three subdirectories—Lang, Plugins, Skins—to the "\pebuilder3032\plugin\adaware" directory. Copy the contents of the Lang and Skins subdirectories into the same directory as ad-aware.exe. Unfortunately, the adaware.inf file included with *PE Builder* is out of date so you'll need to update it. We found an INF file created by Malok that seems to fix it.

In the plugin\adware\ directory open the file adaware.inf and add the lines: `c="Programs\adaware\Plugins",2` and

d="Programs\adaware\Skins",2 to the [Winntdirectories] section. In the [SourceDisksFiles] add the lines:

```
alert.wav=a,,1
defs.ref=a,,1
default.awl=b,,1
Ad-Aware SE default.ask=c,,1
```

And remove the lines aawhelper.dll, reflist.ref, English.bmp, English.det, and English.ini. from the section. The finished file should look like:

```
[WinntDirectories]
a="Programs\adaware",2
b="Programs\adaware\lang",2
c="Programs\adaware\Plugins",2
d="Programs\adaware\Skins",2

[SourceDisksFiles]
adaware.cmd=a,,1
ad-aware.exe=a,,1
alert.wav=a,,1
defs.ref=a,,1
default.awl=b,,1
Ad-Aware SE default.ask=c,,1
```

Save the *inf* file and enable the *Ad-Aware* plugin within *PE Builder*. If you followed directions, the application should now be properly installed.

You should also remember that when you run a scan from the BartPE disc you need to perform a custom scan and set it to scan the drive on which the OS is installed. If you don't, *AdAware SE* will simply scan your BartPE disc, which is useless.

Burn your BartPE disc

Once you're satisfied with your disc contents, click "Next" to get to the Build screen. Here you tell *PE Builder* where to store the source files for the compilation. These source files stay on your machine so you can quickly and easily create an ISO disc image at any time. You can change the target directory for storing files but make sure you have enough space—it will require about 800MB.

PE Builder will offer you the option to create an ISO image and ask where you want to create it. The default location is the *PE Builder* directory itself. We strongly recommend that you let *PE Builder* create the ISO at this time. The program will scoop up and compile the plugins and drivers you've collected and read the necessary files from your Windows CD. Once done, all you have to do is fire up *Nero*, select Recorder/Burn Image and point it to the *PE Builder* directory. Voila! You've created a personalized BartPE disc.

When you're ready to compile your disc, make sure the Create ISO Image box is checked and that you know where the final ISO disc image will be sent.

When *PE Builder* has made your ISO, use *Nero* to burn the image.

If you make further tweaks to your BartPE disc, you'll need to select "Manual build" when you start.

Test it

Test the BartPE disc by putting it in your machine and rebooting. Make sure your BIOS is set to boot from the optical drive. If you're not running any exotic RAID or SCSI drives as your primary boot disk, it should work like a charm. If Windows is installed on a SATA drive or RAID array, and BartPE isn't detecting it, you may have to go back to the "Add drivers" section and make sure you installed the driver for your particular hard drive controller.

After you've used *PE Builder* once, the program will begin asking you if you want to do a manual build, an auto build, or an ISO build. To rebuild your BartPE disc from scratch, use the "manual build" option. To rebuild the disc with the same drivers and plugins you originally used, but update to the latest operating system files, select "auto build" and make sure your OS disc is handy. If you just want to rebuild the original ISO you created and save the appropriate files on your hard drive, select "ISO build."

A stock BartPE boot disc will give you this basic desktop and a Go button to access your features.

Is it legal?

When we recommended BartPE in our 2004 Trauma Kit, readers asked whether it was legal to build such a disc. According to Bart Lagerweij, who has survived Microsoft's scrutiny thus far, it depends on how you use it.

A BartPE disc can be legally used as long as the BartPE disc and the licensed version of Windows you used to create the BartPE disc are not used simultaneously. So if you create a BartPE disc from your OS disc and use it to troubleshoot your own PC, you're fine.

Lagerweij also points out that if you are a licensee of Microsoft's own Windows Preinstall Environment (WinPE) software used by system OEMs and large IT departments, you cannot use BartPE because of the terms of the Microsoft license.

Finally, to truly prevent people from using a BartPE disc as an illegal OS, the program contains a timer that reboots the machine after 24 hours and only allows you to run six processes.

In the Lab

A behind-the-scenes look at Maximum PC testing

CPU Showdown Revisited

We put Intel's new 3.8GHz Petium 4 570J to the test, and refresh last month's scores for the 3.46GHz P4 Extreme

THE SHOWDOWN: In last month's Head2Head (December 2004), we watched as AMD's 2.6GHz Athlon 64 FX-55 blew the doors off of Intel's fastest Pentium 4 Extreme Edition. While there's no doubt the Athlon 64 FX-55 is the fastest mutha in town, we wondered if the lack of CAS Latency 3 RAM hurt the P4's performance. For this retest, we obtained a set of Corsair Micro CL3 DDR2/533 modules and reran our benchmarks using the identical hardware from the previous shootout.

To make the contest even more interesting, we also tossed Intel's brand-new 3.8GHz Pentium 4 570J chip into the fray. The 570 is a bin-speed increase over the 3.60GHz P4 560 and uses the same Prescott core with 1MB of L2. The key difference is the extra 200MHz, support for Microsoft's NX, and an improved power-management mode that makes it run cooler.

For our Intel tests, we used an Intel D925XECV2 board, with the only changes being processor and RAM timings. We also used the same WD2500JB drive and clocked the PCI-E GeForce 6800 Ultra card to the same speeds as the AGP GeForce 6800 Ultra card. The same drivers were used for all tests.

THE RESULTS: The 3.46GHz P4 picks up a decent performance boost from the faster Corsair Micro DDR2 RAM in most benchmarks. Overall, we saw a 2 to 4 percent increase in performance from the lower latency RAM; unfortunately it wasn't enough to make a difference as the CPU continues to be thrashed by the Athlon 64 FX-55.

The new P4 570J leaves all others behind in the application-intensive *SYSmark2004* tests, but is a mixed bag in gaming. In many tests, it's actually a little slower than the 3.46GHz Pentium 4 Extreme Edition, which already lags behind the Athlon 64 FX-55.

In our tests, we also found an odd glitch in our *Mathematica* benchmark results that appears to be a reporting bug. Based on our observations, it's likely the P4EE took 597 seconds, not 497 seconds to complete its run. We base this theory on the retests of the 3.46, 3.4, and 3.8 P4 processors, none of which could break the 600 second barrier by more than a few seconds.

THE UPSHOT: The Athlon 64 FX-55 is still the champ, but the P4 570J wins in application testing. Still, until Intel bumps the Prescott up to the 1066MHz bus and introduces the 2MB cache version, it looks like the P4 will be eating Athlon 64 FX dust for the foreseeable future.

CPU	Athlon 64 FX-55	Intel Pentium 4 570J	Intel Pentium 4 EE	Intel Pentium 4 EE
CPU clock	2.6GHz	3.80GHz	3.46GHz	3.46GHz
Frontside bus	Core Speed	800MHz	1067MHz	1067MHz
Chipset	VIA K8T800 Pro	Intel 925XE	Intel 925XE	Intel 925XE
RAM	1GB Corsair DDR400	1GB Corsair DDR2/533	1GB Corsair DDR2/533	1GB Corsair DDR2/533
RAM timings	2-3-3-8	3-3-3-8	4-4-4-12	3-3-3-8
Board	MSI K8T Neo	Intel D925XECV2	Intel D925XECV2	Intel D925XECV2
SYSmark 2004 Overall	202**	**217**	201	204
SYSmark 2004 ICC	235**	**253**	231	232
SYSmark 2004 OP	173	**186**	175**	179
Mathematica (seconds)	**467.99**	595	497	594.7
Quake III Arena "Normal" Four (fps)	**509.7**	471	477	487.8
Doom III 1.1 "Low Quality" (fps)	**114**	92.7	93.3	96
3DMark 2001 SE Overall	**26904**	22905	23710	24240
3DMark03 Overall	**13137**	12683	12607	12663
3DMark03 CPU	**1204**	1024	1035	1054
3DMark05 Overall	**4438**	3959	3917	3915
3DMark05 CPU	5203**	**5379**	4917	5060
UT2003 FB 6x4 (fps)	**353**	271	286	290
Premiere Pro (seconds)	622	**458**	510**	506
Photoshop 7 (seconds)	**243**	263	268	265
MusicMatch 9 (seconds)	235	232	**222**	225
HT Photoshop 7 (seconds)	481	**391**	399**	402
HT MusicMatch (seconds)	**302**	382	370	375
Sandra RAM (MB/s)	**5770****	4833	5440	5780
SETI (minutes)	89.9	94.6	104.8	104.3

*Best scores are bolded. **Previous winner*

HighSpeed PC Tech Station

TESTED & GEEK APPROVED

We've been waiting for someone to build a tech bench that could improve upon the "tech station" concept we've embraced in our Lab. That time has finally come with HighSpeed PC's new Tech Station.

The Tech Station is similar to the now-defunct Senfu tech bench. It's essentially a shelf that you drop your motherboard, drives, and power supply on top of, thereby allowing easy access to PC components, which is essential for testing. The HighSpeed design greatly improves upon the Senfu's because it's constructed of non-conductive material, and includes a bar that stabilizes add-in cards. In the past, we had the misfortune of blowing up components because they wiggled around in the Senfu.

The Tech Station also includes a channel to hold your hard drives under the top tray and a fan to keep air moving over your components. HighSpeed offers the Tech Bench in several different sizes to suit your needs. **$80, www.highspeedpc.com**

We're Looking for a Few Good CPUs

Got some spare CPU cycles? Then join *Maximum PC's* Folding@Home team and help unlock the secret of human proteins. The Folding@Home project uses spare CPU time from PCs distributed across the planet to crunch data about human protein that may be the cause of diseases such as Alzheimer's and Parkinson's.

The project's organizers say simulations that would take 300 years to run on a single machine can now be accomplished in a month using the 140,000 distributed computers currently participating.

If you'd like to join and help the cause, download the client from **www.stanford.edu/group/pandegroup/folding/index.html** and enter team 11108. Team Maximum PC is in the top 10 leader board, and in hot pursuit of a top five position.

Best of the Best

As of January, 2005

We've made just a few nips and tucks since we last ran our list in November. Sony's updated dual-layer DRU-710A bumps the DRU-700A thanks to its faster DVD burn speeds. (At press time, we received NEC's new dual-layer 16x burner, so check back next month to see if Sony can stay on top.) We've also added a large LCD monitor to the mix with HP's spectacular f2304 panel. We know many will balk at the $2,000 price, so the Dell 2001FP continues to be our pick in the "normal" category.

In other news, Dell's Axim X50v bumps its sibling, the x30, from the list. We've also removed two categories: Socket 478 motherboards and Athlon XP. Both are dead—for everyone but budget buyers. Asus' A7V Deluxe is still our top pick for the Socket 939 boards, but we'd be remiss if we didn't tell you that nForce4-based boards are entering the scene. We've intentionally left out the LGA775 Pentium 4 category this month until we can see boards equipped with the new Intel 925XE chipset using the 1066MHz bus. We just don't think it makes sense to buy an 800MHz FSB P4 board right now.

High-end videocard: nVidia GeForce 6800 Ultra

Budget videocard: ATI Radeon 9800

Do-everything videocard: All-in-Wonder Radeon 9800 Pro

Soundcard: Sound Blaster Audigy 2 ZS Platinum

Serial ATA hard drive: Western Digital 740GD Raptor

Parallel ATA hard drive: Maxtor DiamondMax 10

DVD burner: Sony DRU-710A

Large LCD monitor: Hewlett-Packard f2304

Normal LCD monitor: Dell 2001FP

High-end CRT monitor: NEC FE2111 SB

Socket 939 Athlon 64 motherboard: Asus A8V Deluxe

Portable MP3 player: Apple iPod 40GB

Photo printer: Canon i9900

Pocket PC PDA: Dell Axim X50v

Palm OS PDA: Palm Tungsten C

7.1 speakers: Creative Labs 7.1 Gigaworks S750

5.1 speakers: Logitech Z-5500 Digital

4.1 speakers: Logitech Z-560

2.1 speakers: Klipsch GMX A-21

Analog headset: Sennheiser PC-150

USB headset: Plantronic DSP-500

Our current gaming favorites: *Evil Genius, Pacific Assault, Rome: Total War, Half-Life 2, Desert Combat Final*

Maximum PC's New Year Resolutions

BE NICE TO INTERNS

KEEP AN OPEN MIND

CURB OUR ENTHUSIASM

Alienware Area-51 ALX SLI

SLI delivers on high-resolution gaming, but…

When we put out the request to system manufacturers for an SLI machine that consumers can actually purchase, Alienware was the sole PC maker to respond. The company submitted its water-cooled, dual-GeForce 6800 Ultra-equipped ALX box to our Lab for review.

Alienware beat other system makers by using a motherboard part it had built for its Video Array system—proprietary technology that uses a "Video Merger Hub" to let users build an SLI rig with any PCI Express graphics cards. As it turns out, Alienware wasn't quite ready to show off this exclusive technology, but did manage to get us the first production machine with SLI capabilities. Most of the SLI demonstration systems we've seen have required huge cases to accommodate the workstation/server Xeon motherboards. Alienware's proprietary X2 motherboard, on the other hand, is about the size of a typical ATX mobo.

The ALX itself is an impressive feat of water cooling, effectively quelling the heat generated by both of the GeForce 6800 Ultra GPUs as well as the chipset's north bridge and two CPU sockets. Although the X2 mobo can house two Socket 604 Xeons, ours came with just one installed. Alienware's rationale is that few games are capable of taking advantage of the second processor, so why incur the added cost? For what it's worth, the cost of a second CPU would have added about $800 to the price of this rig.

The X2 board uses Intel's E7525 which is only certified for DDR2/400 speeds. Between the registered RAM, low clocks, and increased latency, the ALX SLI takes a massive hit in memory performance.

Fortunately, graphics performance makes up for the laggy RAM. The water-cooled GeForce 6800 Ultra cards outperform everything we've seen to date. Of course, there's a caveat: A single GeForce 6800 Ultra card is already overkill for this generation of games, so two cards are doubly overkill. In fact, it's difficult to see any performance gains in today's games unless you're running at super-high resolutions like 1600x1200.

With this said, the SLI rig blazed through our synthetic benchmarks.

Alienware's ALX SLI lets you game at ultra-high resolutions with AA maxed out.

In *3DMark05*, the system pulled down about 7,300—that's almost 44 percent higher than with a single card. In *3DMark03*, we saw a whopping 65 percent increase in performance.

Unfortunately, the ALX system didn't shatter any speed records in our application tests.

In *SYSmark2004*, *Premiere Pro*, *Photoshop*, and *MusicMatch* we actually saw better performance from ZT Group's Pro Gaming PC X6514 with its 3.46GHz P4 EE. In Alienware's defense, this can be remedied by changing the CPU configuration. You could, say, run two 3.2GHz Xeons for the same price as the 3.6GHz and gain performance. And unlike P4-based boxes, the Xeon-equipped ALX will work with the 64-bit version of Windows.

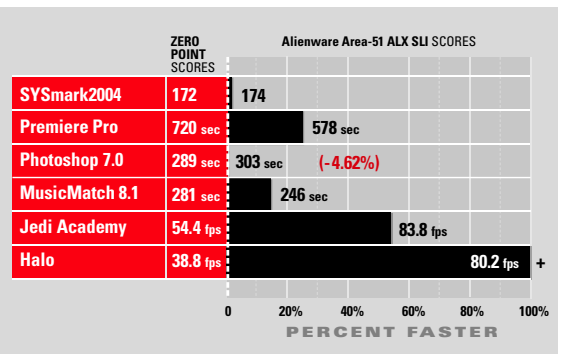
So where does that leave the Area-51 ALX? If you absolutely, positively must have SLI before anyone else, it's pretty much your only option—for now. And if you want a dual-processor-ready box with SLI, this system also makes sense. But with nForce4-based Athlon FX-55 boxes right around the corner (meaning within 30-45 days) this is a tough sell.

We give Alienware points for being the first with an SLI rig, and the water cooling is nice—but the Xeon/E7527 combo is a hard pill to swallow.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS	
CPU	Intel 3.6GHz Xeon (1MB L2 90nm)
Mobo	Intel RoadRunner
RAM	2GB Registered DDR2/400 Corsair (two 1GB sticks)
I/O ports	Eight High Speed USB 2.0 (four front, four rear), two FireWire A, PS/2 mouse and keyboard, parallel, serial
LAN	Intel Pro/1000
DISPLAY	
Videocard	Two nVidia GeForce 6800 Ultras (425 / 550 DDR) in SLI mode
STORAGE	
Hard drives	Seagate 7200.7 with NCQ support running in RAID 0 off Intel ICH6R southbridge
Optical	NEC ND-3500A 16x DVD+R/-R, 4x DVD+RW DL, 4x DVD+RW/-RW, 48x CD-R
AUDIO	
Soundcard	Sound Blaster Audigy 2ZS
FINE DETAILS	
Case	Alienware ALX full-tower case Saucer Silver, PC Power and Cooling 510 Deluxe power supply
Fans/extras	Water cooling for two CPUs and north bridge and 120mm rear fan
Mouse/ Keyboard	Microsoft Wireless Desktop Elite
BUNDLE	
Windows XP Pro, CyberLink PowerDVD, Ahead Nero Express	
BOOT: 43 sec.	**DOWN: 14 sec.**



Our zero-point system includes: a 2.2GHz Athlon 64 FX-51, an Asus SK8N motherboard, 1GB of Corsair Registered TwinX DDR400 RAM, an ATI Radeon 9800 XT, a 250GB Western Digital WD2500JB hard drive, Plextor PX-708A DVD burner and a PC Power and Cooling TurboCool 510 Deluxe power supply.

MAXIMUM PC VERDICT 8

VOODOO2

SLI, fast double-layer DVD burner, and tricked-out water cooling.

VOODOO3

DDR2/400 registered RAM is a major bummer.

$6,200, www.alienware.com

Voodoo Envy m:790

It's the Dream Machine in a laptop

The Envy m:790 is a tour de force of next-gen hardware including PCI Express, DDR2/533, and nVidia's hot new 12-pipe GeForce 6800 Go for graphics. The widescreen Envy also manages to squeeze in two SATA drives running in RAID 0 as well as 8-channel, 24-bit audio.

Voodoo calls the Envy m:790 an "entertainment notebook" and thus gives it a glossy screen that makes video and games look richer and more vibrant. The real star though, is the GeForce 6800 Go, a mobile version of nVidia's GeForce 6800 desktop videocard. The 12-pipe part offers full Pixel Shader 3.0 support. Unlike earlier 6800 parts, however, the 6800 Go is a native PCI Express graphics part, meaning it doesn't use an internal bridge chip for conversion from AGP. In our test system, the GeForce 6800 Go had a 256MB frame buffer and clock speeds of 300MHz for both the core and DDR memory.

For CPU power, Voodoo clamped in a 3.6GHz Pentium 4 560, a proc not known for its cool thermal properties. We counted no fewer than four vents in the bottom of the Envy to keep the CPU, GPU, and sundry other parts cool. Even with its fans, the Envy puts out some serious heat.

Aesthetically, the Envy features a custom paint job that color shifts under certain lighting. Voodoo embedded a video camera in the lip of the bezel but the camera has problems working in low- and moderate-light situations. As an example, in normal office lighting, we found that the camera captured nothing but 4,096 shades of black.

What we really wanted to know, though, was how the Envy stacks up against Dell's XPS, the reigning champ of portable power and the current king of benchmark performance in the Maximum PC Lab.

Because the XPS uses a 3.4GHz Pentium 4 Extreme Edition with 2MB of L3, it's hard to directly compare the graphics solutions. Instead, we have to look at the whole platform, and the results are a mixed bag. In *Quake III Arena* and *3DMark2001*, the XPS came out on top by a slight margin, probably because of the P4EE's larger L3 cache.

But it could be argued that performance in today's games is more important than performance in games from the last millennium. In these benchmarking categories, the Envy is the decisive winner. It's roughly 30 percent faster in the punishing *3DMark05*, cranking out a score of 2,988. In the kinder, gentler *3DMark03*, the Envy runs roughly 50 percent faster than the XPS. Translation: The Envy and its GeForce 6800 Go will be faster for any current or next-generation game than Dell's XPS—and most other laptops, for that matter.

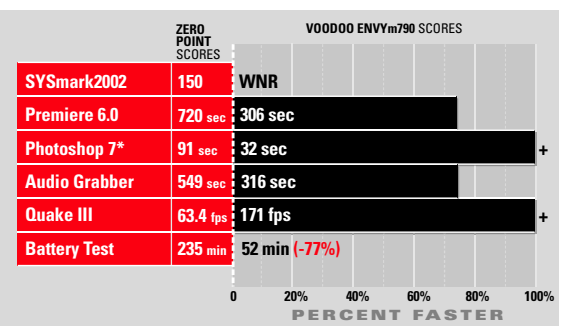
In our application performance tests, the contest was more closely matched. Because *SYSmark2002* has issues running under WinXP SP2, we couldn't get the benchmark to run on the Envy. This is not a knock against the notebook; it just confirms that it's time for us to retire *SYSmark2002* as a benchmark. (We'll soon be rolling out a brand-new benchmarking suite, so stay tuned.) In Adobe *Photoshop 7.0*, both notebooks tied. In *Premiere*, however, the XPS' Pentium 4 Extreme CPU put it ahead of the Envy by about 3 percent. Again, that's pretty close. The upshot is that the Envy is the fastest gaming notebook we've seen to date, although the XPS still manages to hold its own in application performance and some older games thanks to its P4EE CPU.

At $6,800 with custom paint job, the Envy is almost $3,000 more expensive than the XPS. That hurts—but at least it buys you the fastest gaming laptop on the planet.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS	
CPU	3.6GHz Pentium 4E with Hyper-Threading and Intel 915G chipset
RAM	1GB DDR2/533
I/O ports	Four Hi-Speed USB 2.0, two four-pin FireWire A, CF, Smart Media, Memory Stick, SD/MMC, S-video, video in, PS/2, DVI, parallel, serial
Modem	Smart Link 56K Voice Modem
LAN	Intel Pro/Wireless
	Realtek Gigabit Ethernet
DISPLAY	
Video	nVidia GeForce 6800 Go (300MHz core / 300MHz DDR)
Display	17-inch (1680x1050@32-bit)
STORAGE	
Hard drive	Two Fujitsu 80GB, 5,400RPM SATA (Model) MHT2080BH in RAID 0 using Promise FastTrack host-based RAID controller
CD-RW/ DVD-ROM	NEC ND-6500A DVD-/+RW double-layer, 8x DVD-/+R, 4x DVD-/+RW, 2.4x DVD+RW DL, 24x CD-R
AUDIO	
Audio chip	HD Audio Codec ALC880 Codec, 8-channel support
FINE DETAILS	
Other	Media reader, camera, video-in, TV-in port
Lap weight	12.5 pounds
Carry weight	14.5 pounds
BUNDLE	
Windows XP Pro, Voodoo FUEL Software Essentials, Restore DVD, Voodoo Game Doctor (1 year membership). Ahead Nero Burning ROM	
BOOT: 52 sec.	**DOWN: 11 sec.**


ZERO POINT SCORES
VOODOO ENVYm790 SCORES
SYSmark2002 150 WNR
Premiere 6.0 720 sec 306 sec
Photoshop 7* 91 sec 32 sec +
Audio Grabber 549 sec 316 sec
Quake III 63.4 fps 171 fps +
Battery Test 235 min 52 min (-77%)
0 20% 40% 60% 80% 100%
PERCENT FASTER

*Our zero-point notebook is a Dell Dimension 8200, and includes a 1.7GHz P-4M CPU, 256MB DDR266, a 64MB 128-bit DDR GeForce4 Go graphics chipset, and a 5400rpm IBM Travelstar 60H hard drive. *Our notebook Photoshop 7.0 test differs from our new desktop Photoshop test.*

MAXIMUM PC VERDICT 9

MAGIC EIGHT BALL

GeForce 6800 Go and dual hard drives!

PALM READING

Ultra-expensive price and it doubles as a small space heater.

$6,800, www.voodoopc.com

Stupid Wi-Fi Tricks

An 802.11g router battles a bombastic 802.11b router

As 802.11g enters middle age, lots of decent hardware is becoming available at more-than-decent prices. We're also starting to see some crazy new hardware with boldly ambitious attempts at improved functionality. Of course, with wild and crazy innovations come horrible failures and embarrassing missteps. Read on for the gory details.

—WILL SMITH

Buffalo Technology WHR3-G54

Buffalo's WHR3-G54 looks like a standard 802.11g router, but a little digging under the hood reveals a few novel adjustments. Most notably, configuring new clients to connect to the access point has become as easy as clicking a button, thanks to Buffalo's AirStation One-Touch Secure System (AOSS) technology. To make it work, you simply push the AOSS button on the access point, and then click a button on the app that comes bundled with the network card.

Of course, there's always a catch with proprietary technology. As you might imagine, AOSS only works with other Buffalo cards and access points, so if you have a laptop with built-in Wi-Fi, you're outta luck. Ditto when you want to connect a Buffalo card–equipped laptop to a third-party access point—you'll have to type in your 26-digit WEP key to do it.

The WHR3-G54 uses Broadcom's enhanced 802.11g chipset, which can tap multiple channels to gain faster transfer speeds. We're not huge fans of this technology because it tends to hog two or three Wi-Fi channels without granting a significant performance boost. We're *very* unhappy with the nomenclature on the WHR3-G54's box, which implies that High-Speed mode will work with all 802.11g hardware, when it only works with cards that use the Broadcom chipset. Boo! hiss!

Performance was what we've come to expect from Broadcom-powered hardware, with a maximum throughput of 22.4Mb/s on our file transfer test, in the standard 802.11g mode. While we didn't notice a decrease in range, we're surprised Buffalo doesn't include an external antenna (though you can buy one as an option and attach it to the unit). This access point isn't the best we've tested, but its low price—less than $60 street—adds some verve to an otherwise commonplace router.

Look, Ma, no antenna! For some reason, Buffalo doesn't ship an external antenna with the WHR3-G54. Fortunately, it didn't have a discernable impact on range.

Buffalo Tech WHR3-G54

MAXIMUM PC VERDICT 8

+ WATER BUFFALO

A decent price and acceptable performance make this AP an acceptable choice for budget shoppers.

– PLAIN BUFFALO

Proprietary technology has limited usefulness, external antenna should be included.

$80, www.buffalotech.com

ParkerVision WR1500

The front of the box for ParkerVision's WR1500 promises lots of stuff we love to see: "Max Outdoor Distance! Max Indoor Coverage!" When we checked the back of the box, we saw another promising claim: "Guaranteed to Outperform ANY Wireless Router!" A fourth exclamation promises: "1 Mile Wireless!" But these bold claims are backed up with such vague language—"Compatible with any 802.11b, 802.11g, or 802.11b/g compliant wireless adapters"—we couldn't tell if ParkerVision's WR1500 was an 802.11b or 802.11g router.

It's a pretty black box, but the ParkerVision WR1500's slow 802.11b transfer speeds are to be avoided at all costs.

Truth is, the WR1500 is an 802.11b router, and as you can see from the benchmark chart below, this old-school spec is no competition for the 802.11g variety.

The exception was in our long-range tests. While the signal in our office park environment couldn't be reached from a distance anywhere close to one mile, the range was comparable to the best 802.11g routers we've tested, and the WR1500's signal was strong throughout our building and into the parking lot. We received the best range using the included ParkerVision access card, but coverage was decent even with an integrated Wi-Fi card.

Unfortunately, because the router only uses the 802.11b spec, it's painfully slow, even at maximum range. It took nearly five times as long to transfer our 724MB test file as it did using the Buffalo router reviewed here. What's worse, the WR1500 isn't even certified by the Wi-Fi Alliance, so there's no guarantee this router will work with non-ParkerVision hardware. When ParkerVision releases 802.11g hardware that's Wi-Fi certified, we'll take a look at it. Until then, we recommend you stay away.

ParkerVision WR1500

MAXIMUM PC VERDICT 3

+ 1 MILE

This router meets its range claims—kind of.

– 1 FURLONG

802.11b, no Wi-Fi certification, and it's slow as hell.

$200, www.parkervision.com

BENCHMARKS	Buffalo WHR3-G54	ParkerVision WR1500
Wired to wireless (min:sec)	4:18	20:59
Wireless to wired (min:sec)	4:51	19:52

Time to transfer a single 724MB MPEG4 video is measured on an isolated wireless network.

The three antennas on the Belkin Pre-N Wireless Router aren't just for show; they're part of the MIMO scheme that allows the router to reach the highest transfer speeds the Lab has ever seen.

Belkin Wireless Pre-N Router

Advanced functionality and high speeds, but will it work in 12 months?

Imagine if you will, a vendor shipping a product that uses technology from a wireless standard that doesn't exist, and won't for another year or two. Belkin has done exactly that with its Pre-N router, and while the results are mesmerizing, they're also worrisome.

The Pre-N router uses one of the front-runner technologies for the eventual 802.11n spec, which we expect to see finalized in late 2005 or 2006. The MIMO (Multiple Input, Multiple Output) technology uses multiple antennas to maximize bandwidth, but there's a catch. The working group developing 802.11n is considering an alternative technology that's incompatible with a MIMO approach, so there's a strong possibility this router will not be firmware upgradable to the final 802.11n spec. In fact, not even Belkin is promising future compatibility.

During testing, the Pre-N adapter card performed about 10Mb/s faster than any pure 802.11g hardware we've tested. That's pretty good, but there's a downside: In pure 802.11g mode, the router tested significantly slower than the Buffalo router reviewed on the facing page.

On the plus side, Belkin's router features a unique fix for a problem that plagues other routers. Usually when you connect a legacy Wi-Fi card to a high-speed router—for example an 802.11b card to an 802.11g router—everything connected to the access point drops to the lowest common speed. The Pre-N has multiple receivers and transmitters, so every device connected can run at full speed all the time. In the ideal world, we'd see this sort of functionality from everyone's access points.

The bottom line on the Belkin Pre-N is that it's a frustrating mix of good and bad features. If you shell out for Pre-N adapters for all of your wireless machines, you'll have the fastest wireless connection you can buy—at least until the real 802.11n hardware ships. But if you don't use Pre-N clients, you'll probably be better off with a faster, pure 802.11g router.

—WILL SMITH

MAXIMUM PC VERDICT **7**

+ WIRELESS NETWORKING

It's fast, and doesn't drop everyone to a slower speed when old Wi-Fi hardware connects.

– WIRELESS BUNGIE JUMPING

Uncertain future and 802.11g performance isn't as good as with dedicated 802.11g routers.

$160, www.belkin.com

BENCHMARKS

	802.11g	pre-N mode
Wired to wireless (min:sec)	6:47	3:05
Wireless to wired (min:sec)	4:38	2:59

Our test file is a 724MB MPEG4 encoded video file.

Silverstone LC10 HTPC

An excellent enclosure for a DIY home theater PC

Silverstone's LC10 brings power-user amenities, such as four 3.5-inch drive bays and front-mounted USB and FireWire, to the realm of the home theater PC.

Several features set Silverstone's home theater–oriented LC10 HTPC case apart from standard ATX enclosures. The first is its horizontal desktop orientation, as opposed to a more traditional vertical tower. Second, its polished-aluminum front panel allows it to blend perfectly with other home theater components. Third, it includes integrated remote control functionality via a software bundle and a built-in remote sensor.

Building a PC in the LC10 is a little tricky because certain parts overlap each other, requiring you to install components in a very specific order. For example, the lower portion of the optical drive bay extends over the upper right-hand corner of the motherboard area, which is where most ATX power connectors plug into the motherboard. There's barely enough room to squeeze in the plug; as a result, we had to literally fold the connector at a right angle to make it fit.

With four 3.5-inch drive bays, storage options are plentiful, but we'd never stuff four drives into this case as there are no fans to cool them. Instead, the case has an "in from the front, out from the rear" thermal design with an 80mm fan on the front-left of the case, and two 60mm fans above the I/O shield. One optical drive can be added, and Silverstone even includes a sleek aluminum cover that adheres to the drive door for a crisp, clean look when the drive is closed.

We appreciate the system's quiet operation and the low-key lighting—the only light the LC10 HTPC emits comes from two faint lines of light-blue LCD text. And while the software and remote-control functionality that allow you to access your media files isn't as functional as Tivo or Media Center, it's not too shabby. The included remote can also be programmed to perform a huge number of macros and tasks.

All things considered, this is one of the best home theater cases we've tested. It has a few small issues, but should certainly be on the shopping list of anyone looking to build their own home theater PC.

—JOSH NOREM

MAXIMUM PC VERDICT 9

+ COOLING

Sleek design, included remote, and plenty of storage options.

– DROOLING

Design will crimp many ATX power connectors; no hard drive cooling.

$210 ($120 w/o remote and software), www.silverstonetek.com

Kingwin Mutant X

A no-frills case that still manages to impress

A small power cable is routed from the case to the upper portion of the front bezel, allowing it to stay lit even when you open the door to access the 5.25-inch bays.

There seems to be no shortage of low-cost enclosures these days—they've been showing up at the Lab as often as the Brisbane Fire Marshal. The latest entrant is a budget case from Kingwin dubbed the Mutant X. Its signature design trait is the stylized front bezel, which is made from plastic and features a transparent oval with two blue LEDs inside that glow when the system is running. The glowing oval is self-contained within the door, so it's essentially a light-up cover for the drive bays. Falcon Northwest pioneered this feature with its backlit logo, and we have to say the Kingwin version—while moderately cool—is much less impressive. The door swings open to reveal four 5.25-inch bays and two 3.25-inch bays. At the bottom of the plastic bezel is a pop-open door that hides a well-stocked I/O panel containing two USB 2.0 ports, a FireWire port, and audio jacks.

The side door includes a window with an 80mm fan attached that exhausts air from the AGP region of the case (a non-window version is also available). Once open, the interior is sparse yet roomy. We find five more 3.25-inch hard drive bays, with an 80mm fan mounted in front. Another 80mm fan is mounted near the CPU, and an additional 80mm mounting bracket is available should you require additional cooling in the future. One frustrating feature of the Mutant is the complete lack of tool-less drive-fastening mechanisms. You have to use screws for everything, just like in the old days. It's not a deal-killer by any means, just less convenient than what we've grown accustomed to.

This model includes a 420-watt power supply, but considering this case's ridiculously low price we wouldn't put much stock in the PSU's quality. Also, although the case uses an all-steel construction, the relatively thin sheets of metal make it surprisingly light. In fact, it feels more like aluminum than steel.

In the end, the Mutant is a fine case for the money. It offers plenty of storage options, more-than-adequate cooling, and an unbelievably low price—especially considering it comes bundled with a PSU.

—JOSH NOREM

MAXIMUM PC VERDICT 8

+ X ON CASE BEZEL

Affordable, lightweight yet sturdy, and easy to work with.

– X IN BLOODSTREAM

Requires tools, and the plastic bezel feels and looks cheap.

$75, www.kingwin.com

Corex CardScan Executive

This gadget eats through business cards as if they were Pringles

OK, no more empty promises. Start the New Year right by scanning all the business cards you've amassed.

Demonstrating a stubbornness akin to the floppy drive's, business cards persist as a widely traded currency despite the presence of more modern alternatives (think the vCard, PDAs, and Bluetooth-enabled Smart Phones). Thankfully, Corex's new CardScan Executive can help you eliminate the stacks of cards that have been festering on your desk for months. Or has it been years?

The way it works is simple: You just grab a handful of your business cards and individually feed them into the scanner. The process takes about as much time as it would for the average computer geek to shovel a series of Pringles into his maw. As we fed our stack of cards into the CardScan Executive, we noticed several improvements to the already-impressive functionality of its predecessor. For starters, we experienced a 33 percent speed increase and eerily accurate character recognition. And while the new CardScan Executive is still a color scanner, it's now about half the size of the previous version. Even better, it's USB-powered, so your workspace won't be burdened with another bulky power brick.

The real magic is the *CardScan 7.0* software that powers the device. As mentioned above, we found this software's OCR accuracy to be outstanding. We scanned about eight months worth of backlogged business cards and the software correctly identified and slotted approximately 95 percent of the stash without the need for manual editing. For cards that do need to be manually corrected, the software shows you a color scanned image of the card and highlights the area from which the text was grabbed. At this point, it takes just a few seconds to verify the information and correct it. In an elegant touch, *CardScan 7.0* provides numerous ways to synchronize scanned info with your PDA.

If we could change anything about the CardScan Executive, we'd add a more effective bin to catch cards as they're scanned. We'd also fix the software's annoying practice of asking a user to register each time a job is started. Otherwise, the CardScan Executive is a dream.

—GORDON MAH UNG

MAXIMUM PC VERDICT 9

+ HANDSHAKE
Cuts through business cards like a light saber through human flesh.

– BIZ CARD EXCHANGE
Program will nag you to register until you finally do.

$250, www.corex.com

Logitech Z-2300

Disappointing performance take down a former champion

Adding insult to injury, Logitech has hard-wired the Z-2300's speaker cable to the satellites—and provides just five feet of cable per satellite.

When Logitech announced it had upgraded its Kick Ass award-winning Z-2200 speakers, we figured the new product would offer more of what we loved. Tragically, this is not the case. In fact, Logitech's Z-2300 set leaves a lot to be desired, making this "upgrade" seem more like a downgrade.

The most disappointing aspect of the Z-2300 is the satellites, which now look better but sound worse. The squat, gray-ish pods of the previous system have been replaced by more elegant silver-colored satellites that are taller and thinner with black grilles. The satellites sport slightly smaller phase-plug drivers, but are spec'd to deliver the same power as their predecessors—40W per satellite.

Although the new sats are definitely easier on the eyes, they don't offer the same limitless power that the Z-2200 sats possessed. For example, when testing the Z-2200 set, we cranked the subwoofer and master volume all the way to maximum without the least hint of distortion. By contrast, when we nudged the volume knob to three-quarters of maximum, the Z-2300 satellites snapped, crackled, and popped so much we thought we were at the breakfast table. Additionally, during our 20Hz-to-22kHz signal sweep, the satellites emitted a bizarre high-frequency oscillation at about 300Hz we've never heard before, and at the end of the test the subwoofer let out a long, rattling fart that sounded like it had just come off a four-day chili-con-carne binge.

The subwoofer flatulence is a shame, because in every test prior to the frequency sweep, the 8-inch subwoofer delivered incredibly powerful and deep bass response. In fact, in back-to-back tests with our current favorite 2.1 rig—the Klipsch ProMedia GMX A-2.1—the Logitech subwoofer dominated the proceedings, although the Klipsch satellites sounded much crisper.

In the end, Logitech has taken a significant step backward with the Z-2300 system. At rational volume levels, the speakers deliver deep bass and solid, punchy mids and highs. Crank it up a notch or two, though, and quality disintegrates. Granted, most people rarely crank their speakers to maximum volume levels, but when you do go all-out, you sure as hell don't want the sound to fall apart. That's precisely why we conduct all our tests at peak volume. We wouldn't be *Maximum PC* if we didn't.

—JOSH NOREM

MAXIMUM PC VERDICT 7

+ FIDELITY
Sublime audio at normal listening levels.

– INFIDELITY
Satellites crackle at high volume and subwoofer farts during extremely deep bass.

$150, www.logitech.com

Buffalo DriveStation 160GB

Not the most exciting drive, but it gets the job done

The Buffalo DriveStation is your basic 160GB hard drive sheathed in a plastic shell. There are no fans to keep the 7,200rpm drive cool, but during testing the chassis did an excellent job of dissipating the drive's heat.

While the unit we received features a Hitachi drive, Buffalo uses a variety of drives in its DriveStation line, so it's impossible to know which drive will end up in a particular unit. The front of the DriveStation features a solitary light indicating drive activity, while the rear of the device includes a USB 2.0/1.1 port, a power plug, and a switch that lets you set the drive to turn on and off along with the PC or simply stay on all the time. Like most backup drives, the exterior looks clean and simple.

The drive is bundled with a trio of utilities for data backup, power management, and drive formatting. We suppose the drive-formatting software could be useful for folks who don't know how to locate Windows' Disk Manager. The power-management software is nice because it lets you set a timer that allows the drive to go into power-saving mode after a period of inactivity. You can also conveniently shut down the drive completely and turn it back on via the software, which is useful if you're too lazy to flip the switch on the drive's backside. Hey, we understand.

The meat of the bundled software—the backup app—is useful and does its job sufficiently, allowing you to create backup scripts that can be executed on demand or on a schedule you determine. Our only beef is that the software doesn't do incremental backups, which are practical because they save only what's been changed or added to a folder since the last backup. Instead, if you set the software to save your "My Documents" folder every day, after a week you'll have seven backups of your documents. Not only is this inefficient, but it's also bound to fill the drive quickly.

All told, the DriveStation doesn't bring anything new to the table, but it capably performs its duties. Plus, despite its $300 MSRP, the street price is about half that amount, making it a compelling product if you're on a tight budget.

—JOSH NOREM

The DriveStation boasts the smallest footprint of any backup drive we've tested thanks to its fan-less design.

MAXIMUM PC VERDICT 8

BUFFALO PELT

Small, quiet drive and decent software.

BUFFALO CHIPS

Doesn't stand out in the crowd of backup drives.

$300, www.buffalotech.com

AOpen XC Cube EX65

Pretty on the outside—and that's about it

The XC Cube's sexy exterior can't hide some fatal character flaws.

Mom always told us that looks aren't everything. Such is the case with AOpen's XC Cube EX65. The company's small formfactor box looks mighty sexy, but has a few rough spots we'll call "character flaws."

Externally, the EX65 PC has a sleek, curved front panel and a door that cleverly hides the unsightly optical drive. Internally, the EX65 is based on Intel's 915G/ICH6 chipset, which features integrated graphics that work OK for average, run-of-the-mill computing. Serious gamers can stab in an x16 PCI Express graphics card for more frames per second. Like most small formfactor boxes, the EX65 supports only single-slot cards. We were able to install a GeForce 5750 card without any problems, but in a stunning setback, our plans to seat a Radeon X800 XT or GeForce 6800 GT were quashed.

For some reason, the EX65 comes with only enough power leads to run the optical drive, the hard drive, floppy drive—and nothing else. And because high-power PCI Express graphics cards use the newer six-pin connector, you're screwed; even though the EX65's 275-watt power supply could *probably* handle an XT or GT card, the leads just aren't there.

While we're at it, we'll also bitch about the EX65's lack of parallel ATA ports. AOpen gives you four SATA ports and a meager single PATA port. That's just not enough PATA for people who want to reuse their current PATA drives along with an optical drive. We would also have liked it if the four SATA ports were put to use through an external SATA adapter for easier installation.

Our final gripe is the outrageous noise level. We fitted the LGA775 with a 3.6GHz, er, Pentium 4 560 chip. Under heavy CPU loads, the EX65's CPU fan spins up to 5,500rpm and sounds like a leaf blower set to high. We understand that keeping a Prescott cool is a chore, but this thermal solution isn't much of one.

—GORDON MAH UNG

SPECS	
Chipset	Intel 915G (LGA775)
RAM	Two DDR333/400 slots
Expansion slots	One x16 PCI-E, one PCI
Storage	Four SATA, one PATA
Power supply	275 watt
Audio	Onboard AC97 5.1
LAN	10/100/1000
Ports	Four High Speed USB 2.0 (four Internal), three FireWire A, PS/2 keyboard/mouse, Serial, parallel, RCA SPDIF, optical SPDIF (two)

MAXIMUM PC VERDICT 6

DERRINGER

Great looks and easy to work on.

PEN GUN

Too loud under loads and not enough power leads.

$325, www.aopen.com.tw

MP3 Player Mashup

Presenting three wee MP3 playees—one is elegant, one is generic, and one just stinks

Some say a giant asteroid hit Earth and killed the dinosaurs. Other people argue that a storm of miniature hard drives are pummeling planet Earth and killing all flash memory-based MP3 players. We're not sure about the former, but we know the latter theory isn't true because we're still squarely ensconced in flash-based devices. This month, we compare three lightweight players from three different civilizations.

—LOGAN DECKER

MSI MEGA 516 256MB

Whipping out the Mega 516 is a sure way to draw admiring glances, thanks to the player's elegant design and scalpel-sharp two-color OLED screen (for more on this mesmerizing display technology, check out our massive tech preview on page 30). You'd never suspect that this brushed-aluminum beauty is guilty of one of the worst design blunders in MP3 player history.

With a non-standard headphone jack and USB 1.1 transfer speeds, the Mega 516 proves that sexy doesn't make up for stupid.

Instead of using the standard jack necessary for a fairly important accessory we call *headphones*, Mega 516 uses the smaller mini-jack instead. Exactly how stoned do you have to be to make a decision like this? The bundled headphones sound even worse than the crap that typically comes with MP3 players—we've heard better sounding music on hold. The result: We had to buy an adapter and use our own earbuds. And while the sound from the player was fine, the adapter added bulk and looked goofy.

The Mega 516 has 256MB of internal memory and an SD card expansion slot. Both show up in Windows Explorer as removable drives—nice! But once again, we were flummoxed by MSI's poor judgment—the Mega 516 supports only USB 1.1 transfer speeds. We might have been able to forgive one major flaw for a player this pretty (and the SD slot is a nice touch), but not two. *Next!*

The MuVo Slim isn't just one of Creative's sexiest players; it also sounds amazing.

Creative MuVo Slim 256MB

The exact width and length of a credit card and a wispy 5mm thick, the MuVo Slim nearly blew out our contact lenses with its explosive volume and awesome sound. At the default setting, tracks sound absolutely crisp, and there are no funky audio blips when moving between tracks. But switch to the "Rock" EQ setting and all hell breaks loose. Rimshots crack like a pool cue being whacked over your head, and bass notes are distinct without a hint of mushiness. (There are a handful of other settings for mellower music and a five-band graphic EQ as well).

If you require further persuasion, the MuVo includes an FM tuner with autoscan, up to 32 savable channel presets, and direct recording from FM, as well as a voice recorder with a built-in mic. The player charges through the USB port and uses Windows Explorer for management.

We're still waiting for OGG support from Creative, and the removable battery clocked in at a decent, if not heroic, 13.5 hours. But it all comes down to the sound, and the MuVo Slim is fat at that.

GoVideo Rave-MP AMP128

It's a nice shade of red; that's good—we like red. But otherwise, the 128MB AMP128 isn't a particularly distinguished MP3 player. Even though it has an FM tuner and SD card slot, it loses in more important areas, and loses big time.

For one thing, it simply doesn't get loud enough. That's bad. Second, the headphone jack is on the side of the player rather than the top, making the headphone plug stick out to the side and inconvenient for pocket transport. That's no good either. And finally, the player actually crashed when we were playing with the voice recorder. We'll let you make up your own mind about that one.

With its timid volume level and awkward design, it's hard to get excited about the AMP128's other, more exciting features.

The battery puts out a reasonable 14-plus hours, and the sound quality is good, though not nearly as punchy and bright as the MuVo Slim. For the price of the 256MB version ($130), you could get the MuVo Slim instead, and put a little zest in your life.

Note: We test all MP3 players with Shure's E3c earbuds ($180), noting bundled headphones or earbuds only when they are acceptable, which they rarely are.

MAXIMUM PC VERDICT 4

+ ELEPHANT RIDES
Player looks good, OLED screen looks even better.

– ELEPHANTIASIS
Non-standard headphone jack, USB 1.1-only transfers.

$130 (street), www.msi.tw.com

MAXIMUM PC VERDICT 9

+ PIG SNACKS
Thin, sexy, and sounds *fantastic*.

– PIG STIES
No sound during fast-forward, no OGG support.

$110, www.creative.com

MAXIMUM PC VERDICT 6

+ RABBIT'S FOOT
FM tuner, SD card slot.

– RABBIT TEST
Average sound, below-average design.

$100, www.rave-mp.com

Seagate 5GB Pocket Drive

Slow transfer rates make this miniature hard drive a hard sell

Spin the black part around and a 6-inch USB cable unfurls, then tucks neatly back into the drive for transport.

The definition of a *Maximum PC* verdict of 7 reads, "These products often come with a frustrating mix of good and bad features." This is precisely the case with Seagate's new 5GB Pocket Drive. The drive boldly breaks new ground by being the highest capacity drive of its size on the market and by using a hard drive rather than flash memory as its storage medium. The rub is that it's slow. Really, really slow. But this sluggishness needs to be weighed against the drive's positive traits, of which there are several.

First, the 5GB capacity means the Pocket Drive holds more than twice as much data as the highest capacity flash-based keys, which top out at 2.1GB. This huge capacity, for such a small package at least, is made possible by Seagate's recently released 1-inch hard drive dubbed ST-1, which has a 2MB buffer and a spindle speed of 3,600rpm.

Another cool and welcome feature is the bundled proprietary software "toolkit" that lets you perform a wide array of useful tasks, such as partitioning the unit into both "secure" and "public" partitions, which allows you to keep secret files on the drive. The included software also lets you write-protect the drive, make it bootable, format it, and even restore it to factory defaults. M-Systems (one of the biggest players in the flash-based USB key market) offers a similar security option on its flash drives, and we're pleased that Seagate's version is just as easy to use.

Now for the bad news. As stated before, this drive suffers from seriously slow transfer rates. During testing, we ran it head-to-head with a 2GB flash drive from M-Systems, and the flash drive ate the Pocket Drive's lunch, writing 1GB of data in just 4:27 (min:sec) compared with an agonizing 12:45 for Seagate's drive.

The Pocket Drive is much larger and more affordable than flash-based alternatives, but this value comes at the price of speed. In our minds, speed is just as important as capacity and compatibility because of the various costs (money, opportunity, and otherwise) associated with time, so we advise you to proceed with caution.

—JOSH NOREM

MAXIMUM PC VERDICT 7

+ FLASH DRIVE
Large capacity, excellent software, and highly portable.

– FLASH FLOOD
A lot slower than USB flash drives.

$200, www.seagate.com

Signature Z1 CD/DVD Printer

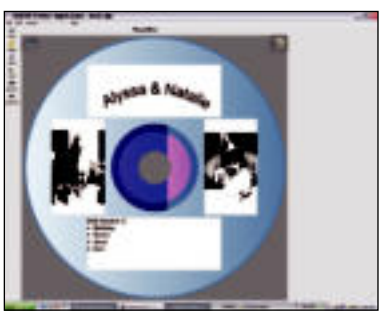
It's not pretty, but it gets the labeling job done

The Signature Z1 is small, quiet, and capable—just don't expect any frills. And don't print anything but text.

I received an award for the best male penmanship in the third grade. Unfortunately, the honor—bestowed upon me by my peers, no less—resulted in me not putting any further effort into improving (or even maintaining) my hand-writing skills. Nearly 30 years later, I still have the best penmanship…for the third grade. But in the real world, it just plain sucks. As in, no one can read my chicken scratch when I label audio CDs and digital-photo DVDs.

Enter the Signature Z1 CD/DVD Printer, a phonebook-size thermal-transfer printer that lets you print directly onto CD/DVDs. The all-plastic construction feels a bit flimsy, but this USB 1.1 printer is simple to install, even easier to use, and reasonably quiet. Unfortunately, while the 200dpi resolution produces solid-looking text, the quality breaks down pretty quickly when you try to print all but the most basic graphics. Photos are particularly hard on the eyes—the result is an awkward-looking image that resembles crude clip art samples rather than pictures.

The bundled basic editing software lets you add text and black-and-white photo elements to four areas of a CD or DVD surface—the top, bottom, left, and right.



The included editing software is barebones, allowing you to import photos as well as place regular and fancy, curvy-looking text.

You can only print in one color—a black ink cartridge is included, but red, green, and blue cartridges are also available. Each cartridge costs $20 and will print up to 200 "print areas," or 50 CD/DVDs with printing in each of the four areas.

For what you get, the Signature Z1 is a bit pricey. For around the same price you can buy a four-color printer and CD/DVD labels and create much more appealing visuals for your home-made media.

—STEVE KLETT

MAXIMUM PC VERDICT 6

+ NEAT NANCY
Simple to set up and use, and it's quiet.

– MESSY MARVIN
Offers zero frills, and graphic reproduction is poor.

$140, www.primera.com

USB Key Cage Match

2GB pocket-size storage solutions face off

In addition to reaching capacities up to 2GB and beyond, today's USB keys have splintered into two factions: flash-based and hard drive-based units. To see which technology rules, we sent three new "keys" to the mini-Gitmo we call the Maximum PC Lab. Our testing regimen consisted of a 1GB read/write test using files ranging in size from a lowly 2Kb to 300MB. With stopwatch in hand, we put them to the test.

—**MICHAEL COLEMAN**

M-Systems: Smart DiskOnKey

M-Systems pretty much invented the USB key and in the process set a high standard for the category. This all-new flash-based 2GB version mostly lives up to the company's reputation.

During testing, the key performed reliably and worked in every USB port it was plugged into. It posted the fastest read times of the keys reviewed here and came in second, by a hair, in write times. Overall, its performance feels snappy and responsive. It is recognized instantly and transfers files quickly.

Though we're not fond of this drive's "cheese wedge" formfactor, its performance is excellent.

As with all M-Systems keys, the Smart DiskOnKey ships with proprietary security software that lets you password protect a portion of the key. As an added convenience, you're given the option to designate your own PC as a "no password zone."

The only real complaint we have with this key is its formfactor, which looks and feels a bit shoddy. Every other M-Systems key we've reviewed has been sleek and stylish, whereas this one looks blocky and generic.

MAXIMUM PC VERDICT 9

+ SNOOPY DANCE
Password protection for files, zippy transfers.

– ODIE DROOL
Design is unappealing, case scratches easily.

$470, www.diskonkey.com

Verbatim Store 'n' Go

The Store 'n' Go is the interloper in this roundup, using a teeny 2.2GB hard drive instead of flash memory as its storage medium. Because of the hard drive's much larger footprint, the Store 'n' Go is bigger in size than the flash-based units. Still, it fits in your pocket, and is the only drive in the roundup to include a neoprene carrying case. What's more, it connects to the PC via a two-inch cable that tucks back into the drive's body when not in use.

Store 'n' *Slow* would be a more appropriate name for this hard drive-based USB drive.

Sadly, the hard drive's transfer times were much slower than those posted by the flash-based drives. It puttered to dead last in both our read and write tests.

To its benefit, the Store 'n' Go is the least expensive of the bunch—almost half the price of M-Systems' key. But we think it's worth it to pay a bit more for a drive that's both faster and more portable.

MAXIMUM PC VERDICT 6

+ MOBY DICK
Easy connection via small cord.

– FREE WILLY
Very slow transfer rates.

$250, www.verbatim.com

Memorex TravelDrive

Memorex's flash-based USB drive has exactly what most people look for in a USB key drive: a small footprint and great performance. During testing, this USB 2.0/1.1 drive reported the fastest write times of the bunch, and read speeds that were just a tick slower than those of M-Systems' offering.

We have nothing but praise for the TravelDrive's rubberized casing. It feels solid in spite of its miniature size, and has a sporty, rugged look that's just plain cool. Unfortunately, the small plastic loop that makes the drive portable on a key chain broke off of our review unit—so carrying the drive like a key is not advisable. The loops on the other drives were much sturdier by comparison.

Finally, the drive is the only one in this roundup to include a physical "read-only" switch that you can toggle to prevent the contents of the drive from being mistakenly erased. It's a handy addition to a solid-performing drive.

The Traveldrive includes a handy "read only" switch you can toggle to lock down the drive's contents before loaning it to a doofus.

MAXIMUM PC VERDICT 8

+ PETA
Highly portable, excellent performance.

– KFC
No encryption software, and keychain loop is fragile.

$300, www.memorex.com

It's a Bag, Bag, Bag, Bag, World!

It takes more than good looks to build a perfect laptop bag

We'll admit: *Maximum PC* editors are suckers for a good-looking bag, especially if it's comfortable to carry, includes configurable storage areas, and sports dozens of small pouches that can fit all the important laptop accessories we need. We toted around each of these new bags for several weeks—here's what we found.

—WILL SMITH

Beneath its front flap, the Boss hides a vault for your laptop. A shock-absorbing bottom and egg crate foam sides ensconce your laptop in a protective cocoon.

Axio Fuse Hardpack

At first glance, the Axio Fuse Hardpack looks ideal, but on closer inspection, its design is inconvenient at best, and unworkable for a demanding user.

The Fuse has two main compartments. One is fully configurable to fit your gear, and uses the same kind of Velcro and foam dividers found in quality camera bags.

It may be pretty, but the Axio Fuse Hardpack is unwieldy and no fun to use. We blame the hard shell.

The other compartment holds your laptop in a snug sleeve and also sports a couple of pouches sized to fit business cards, a PDA, an MP3 player, and your car keys. The bag also comes with an external quick-access pouch for your cell phone.

But there's a problem. Because the Fuse uses an inflexible hard shell design, accessing either of the two interior compartments requires you to open up the bag all the way. Now imagine accessing the compartments when in cramped quarters—like, say, the middle seat in an airplane's coach section; it's an exercise in frustration, to say the least, and will most likely require the help of your seatmates. The configurable section is especially difficult, particularly if what you need is near the bottom of the bag.

The Axio bag is sturdy and looks sexy. And while the hard shell makes it more than capable of protecting your gear, we just can't recommend a bag that makes quickly accessing its contents this difficult.

Axio Fuse Hardpack

MAXIMUM PC VERDICT 4

+ CIRCUIT BREAKER

Lots of storage space, and good protection for your precious electronics.

– FUSE

Contents aren't easily accessible, and near impossible to get at on an airplane.

$140, www.axio-usa.com

Ogio Boss

After we carried our first Ogio bag for a few weeks, we were hooked. The Boss not only protects a laptop from all sorts of damage, it also remains easily accessible for those pesky airport security checks.

For starters, the bag features quick-access external pockets for your cell phone, plane tickets, power cables, MP3 player, CDs or DVDs, and even a water bottle. It also includes a spacious inner compartment with room for anything else you might need, including your PDA, gaming devices, and portable hard drives. There's also a fan-file section for your paperwork—or magazines—and an area in the main compartment big enough for a large hardbound book.

The laptop pocket itself deserves special mention. In addition to an egg crate foam sleeve, the bottom of the bag—where the laptop rests—is a curved, padded shock absorber. Drop the bag, and the shock absorber takes the hit so your laptop won't.

We found carrying the Boss to be comfortable. Its wide strap is coated with a high-friction surface so it won't constantly slip off your shoulder, and it's long enough to be worn either across the body or on a single shoulder.

Our only gripe with the Boss is its weight. At 4.5 pounds, it's heavier than the average messenger bag. But given that good laptop protection and low weight are mutually exclusive anyway, we'd rather have a sore shoulder and a working laptop than the alternative.

Ogio Boss

MAXIMUM PC VERDICT 9

+ BRUCE CAMPBELL

Easy access to contents, loads of external pockets, and admirable attention to detail.

– BRUCE SPRINGSTEEN

It's a little heavier than we'd like. And how 'bout some color options?

$120, www.ogio.com

Madden 2005

KICK ASS PRODUCT

Now this is big-time football!

Denied! This year's version of *Madden* features an emphasis on defense.

The evolution from *Madden 2003* to *Madden 2004* represented a quantum leap, a redshift of sorts that resulted in the finest football game ever. While not putting forth as dramatic an improvement, *Madden 2005* adds some unique new features that reinforce its reputation as the ultimate football game.

This year's upgrades focus on defense play-calling and play-making. New play-making controls allow you to modify your players' defensive assignments before the snap, meaning you can change a player's blitz into a zone drop if you think it won't work. Another plus is the addition of the Hit Stick—a means of using the right analog stick on your controller (you do have a modern Xbox/PS2-style controller, don't you?) to deliver bone-jarring, fumble-inducing tackles. It's guaranteed to put a wicked smile on your face the first time you use it.

If you've ever found yourself thinking that coaching is just as much about managing people as calling plays, *Madden 2005*'s improved Franchise mode incorporates players' emotions and attitudes into the simulation. As you play through season after season, players occasionally gripe or even demand to be traded if they don't receive enough playing time. How you react to these predicaments influences your entire team—kowtow to spoiled stars, and your team chemistry rating will plummet, affecting the team's performance.

If you're a football fan, consider *Madden 2005* a must-buy.

—GEORGE JONES

MAXIMUM PC VERDICT 9

+ JOHN MADDEN

Tight controls, realistic play, great-looking graphics.

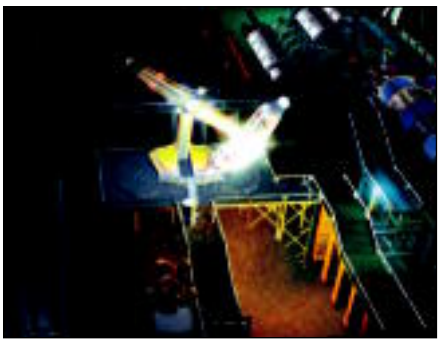
– PAT SUMMERALL

Not the gigantic leap forward that the 2004 version was.

$30, www.easports.com

RollerCoaster Tycoon 3

Chris Sawyer's baby receives an extreme, yet buggy, makeover



The night time is the right time: Flashing ride lights brighten up the park.

Ever since the release of Chris Sawyer's *RollerCoaster Tycoon* in 1999, its fans have clamored for one crucial missing feature: The ability to ride the coasters you create. Finally, developer Frontieral, under the tutelage of Chris Sawyer, has made a 3D extravaganza that surpasses a coaster-head's wildest dreams.

Not only can you ride an astounding lineup of steel and wooden coaster types, but you can experience *any* ride in your park from a first-person perspective. For many, this feature will be the game's sole selling point, but *RCT3* doesn't scrimp on the management side of gameplay.

Starting out in either Career mode (with six missions available initially, and 12 more unlockable) or the open-ended Sandbox mode, you're put in charge of building and managing a theme park. Career mode asks you to satisfy certain requirements—such as increasing attendance, profits, or park worth to certain levels—before you can "win" a mission.

Ultimately, you succeed by keeping guests happy and running the park smoothly. As a manager, you'll hire employees, set prices, research new rides, implement advertising campaigns, and even deal with "celebrity" guests such as the politician Clint Bushton.

Graphically, *RCT3* is the best-looking tycoon game by far. As day turns to night, your park lights up with flashing bulbs and, if you've set one up, a spectacular fireworks display. For the first time, your camera is fully dynamic; with a twitch of the mouse, you can view your park from any angle and zoom in from a birds-eye view to a close-up of a coaster's rust stains.

Even though coaster-building is much easier here, we have some quibbles with the game. Laying out queue lines is still too tricky, and Atari shipped *RCT3* with an inexcusable number of minor bugs, most relating to guest AI and graphics. Atari deserves a spanking for its premature launch, but that doesn't mean you should skip *RCT3*—it's still a thrilling ride.

—CHUCK OSBORN

MAXIMUM PC VERDICT 7

+ THE VOMIT COMET

You can ride attractions; fantastic visuals; and insane detail and depth in management mode.

– THE TOOTHCHIPPER

There were so many bugs in *RCT3* at launch that a beta patch was released on the same day. Placing paths can be frustrating.

$50, www.atari.com

Medal of Honor: Pacific Assault

I never though I'd say this, but I really miss Europe

Dear Mom and Dad,

Sorry I haven't written in awhile, but as I'm sure you're aware, war will keep a man occupied. I can't say exactly where I am right now, but after the attack on Pearl Harbor, my platoon got shipped all over the Pacific, including Guadalcanal and Tarawa.

I know war should never be entertaining, but the boys and I sure had a lot more fun in Europe fighting the Germans. After the first two or three hours, all the jungles have started to look the same. That's OK though; there's no time for sightseeing because the Japanese are a lot tougher to fight than the Germans. They try to flank us, they use cover, and when they get close to us, they charge with their bayonets, screaming "Bonzai!!" Sometimes they get stuck behind rocks and crates, but they're definitely worthy adversaries. The fighting is intense, but I have to admit: After a couple of patrols, the lack of variety in the jungle feels more tedious than exciting.

Don't get me wrong. It's not all jungle patrols here. Occasionally the boys and I get to lay into the enemy with heavy weapons like .50 caliber machine guns, mortars, and even portable artillery. I even got to fly a plane, and I managed to sink an aircraft carrier and a destroyer all by myself! The boys in the squad were amazed that I managed all that without ever laying eyes on a flight school. It might sound easy, but when I was up in that plane, it seemed like the brass was just making up the mission as they went along. The whole operation felt poorly planned and executed.

Maybe it's the jungle heat, but I feel a lot slower here in the Pacific. In Europe I could run fast and aim quickly without any delay. Here I run slow and my rifle arm is sluggish. Sometimes I take enemy fire longer than I should while lining up a shot. Don't worry, Mom, I've never been hit with anything that Jimmy, our corpsman, couldn't patch up in a few seconds. So far I've been shot approximately 300 times and bayoneted a dozen times to boot, but good ol' Jimmy just runs over and patches up the holes lickety-split when I signal for help.

Speaking of my squad, they're a great bunch of guys, even though they always leave most of the killing to me. And I think some of them might have Tourette's Syndrome, because they're always yelling the same phrases over and over like, "They're charging!" even when there's no enemy in sight, or "Good shot, Tommy!" when I shoot a guy two feet in front of me. Maybe they're all just suffering from shell shock or battle fatigue.

Occasionally we'll run big joint ops where we coordinate with other units using a new comm network called the Internet, but it's nothing to write home about. It's hard to get a good connection to the Internet and we had to call back to the States and register with a group called "EA" before we could join the operation, which was annoying and unnecessary.

Well, I have to sign off now. Our squad is supposed to go upriver tomorrow, so I'm going to need a good night's sleep. Take care, and please send more Kleenex and skin moisturizer as I'm all out.

Your son,
Tommy Conlin,
aka Josh Norem

Here's a pic the Sarge took of us manning the AA gun at Pearl Harbor. Why he was taking pictures instead of fighting is beyond me.

Mom and Dad: Here's a picture I took of our Japanese adversaries. They are not very friendly, but they seem a lot smarter than the Germans we fought in Europe.

MAXIMUM PC VERDICT 7

BANZAI PLANT

Implementation of squad medic is superb; lots of insane firefights.

BONZAI CHARGE

Sluggish frame rates and player movement, repetitive, and long load times.

$50, www.eagames.com

Pacific Fighters

The battle for the Pacific—Russian style

***Pacific Fighters* includes dozens of aircraft. Here a Ki-61 'Tony' makes short work of a B-24 Liberator.**

Oleg Maddox is fast becoming a legend in PC flight sim circles. Three critically acclaimed chapters of his high-flying *IL-2 Sturmovik* series have dominated the virtual skies since 2001. Now—in a departure from the franchise's WWII Eastern Front roots—the Russian developer now serves up *Pacific Fighters*, the best Pacific Theater aerial combat sim since Microprose's classic *1942: Pacific Air War*.

Hellcats, Corsairs, and Zekes are the stars here—the list of flyable American and Japanese fighters and multi-station bombers in *Pacific Fighters* tops out at over three dozen—and the exhaustive level of detail on each plane is truly mind-boggling. Exquisite 3D cockpits and beautifully weathered aircraft skins compete for visual attention with the amazing weapons pyrotechnics. (Sadly, however, no torpedo bombers are featured.) Downed fighters break apart and gout flames realistically as the sim's sophisticated damage model shrewdly distinguishes between a few stray bullet holes and a major fuel tank or engine strike. Players can adjust the physics, weaponry, and enemy AI to suit their personal comfort level. Apart from a flawed padlocking system and an annoying tendency for friendly AI pilots to fly into mountains, *Pacific Fighters'* unscripted and immersive single-player game delivers a consistent challenge from full-throttle take-off to sphincter-puckering carrier landing.

The upgraded multiplayer environment also features a massive new 128-player dogfight mode as a supplement to the seamless co-op and campaign-based games, but *Pacific Fighters'* biggest drawing card is its marvelous new oceanic theater. The frantic island-hopping and carrier-based action injects a fresh look and feel to the franchise while still delivering the unflinching realism its dedicated fan base demands.

—ANDY MAHOOD

MAXIMUM PC VERDICT 8

+ CONFIRMED KILL

More than 40 gorgeously rendered WWII aircraft; scaleable realism; strong multiplayer component.

– MIA

AI glitches; crappy padlock view system; no torpedo bombers.

$40, www.pacific-fighters.com

Full Spectrum Warrior

Maybe they should have called it Full Spectrum Bore-ya

Lose one comrade and you can carry him to medical help. Lose two and it's game over.

Originally designed as a training tool for U.S. infantrymen, *Full Spectrum Warrior* is all about gritty realism in its depiction of modern-day urban combat.

You are the phantom general who directs the actions of two four-man infantry squads throughout a series of missions set in a fictional hotspot called Zekistan, where you are tasked with ruining a terrorist regime's day.

While directing your troops to navigate Zekistan's war-torn streets, you encounter entrenched enemies, against which you must use suppressing fire and flanking tactics. This play cycle frequently repeats itself; this repetition is the game's biggest flaw.

In the end, the ultra-realistic presentation—which is supported by authentic military lingo and realistic troop banter (expletives abound)—solid AI, co-op options, and the palpable realism and tension can't quite save the day for *Full Spectrum Warrior*.

—STEVE KLETT

MAXIMUM PC VERDICT 6

+ HOO-HA!

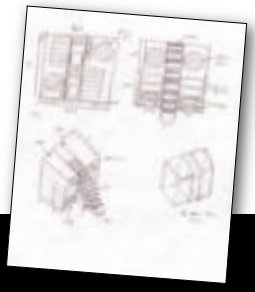
Authentic feel, solid AI, and two levels not included with the Xbox version.

– HOO-D'OH!

A little on the short side, and a bit too repetitious throughout.

$50, www.fullspectrumwarrior.com

MAXIMUM PC Rig of the Month

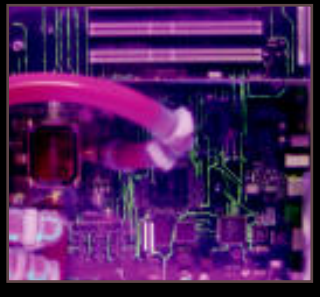


THIS MONTH: Andy Crawford's Mirage

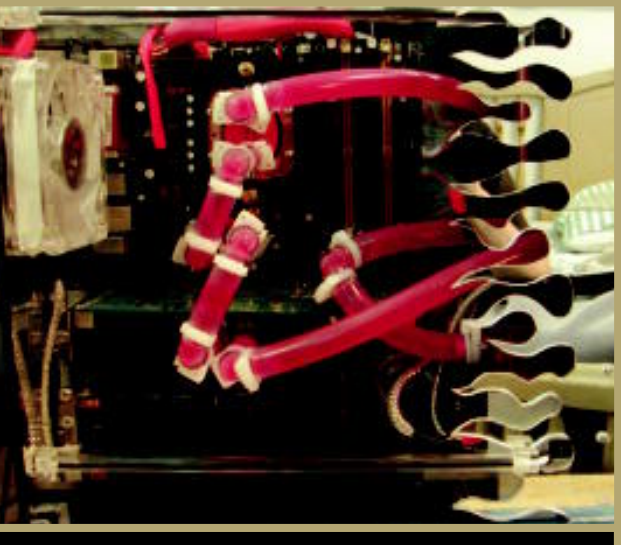
A true power user isn't constrained by convention. Just ask Andy Crawford, who dared to build a computer that's equal parts Mac and PC. That's right: two complete systems considered by many to be at odds with each other living side-by-side in a single, albeit very roomy, case. What's more, each system runs its native OS, an emulator of its neighbor's OS, and Gentoo Linux for a thoroughly comprehensive computing experience.

But clearly, Mirage is about more than a bunch of OSes. It took eight months of planning and constructing a full-scale prototype for Crawford to get all the hardware details just right. With the final mod, he went all out with aesthetic extras: stealthed optical drives, sleeved cables and wires, mirrored overlays, elaborate lighting, etched circuitry—all of it done with his own two hands.

Switches across the front of the PC control various fans and lights, the monitor, and a tachometer up top, which measures CPU usage. The large red military switch controls the water-cooling and Peltier systems.



Under black light, the motherboards and videocards glow with UV reactive circuitry, thanks to a .99 cent pack of Bic Fluo pens, a steady hand, and lots of patience.



Red food coloring and UV reactive dye give the custom water-cooling system the appearance that it's pumping with blood.

"I have a little mantra about modding my cases: nothing goes untouched," says Crawford. Not even his CRT, which houses two red cathodes for added effect.

Stair-stepping the front of the case are eight hard drives (seven dedicated to the PC), flanked by red LEDs that are wired to a custom pattern controller.

If you have a contender for Rig of the Month, e-mail **input@maximumpc.com** with high-res digital pics and a 300-word write-up.

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